

MATERIALS ANALYTICAL SERVICES, INC.
DUST SHEET

PAGE # 11Client: LAW ASSOC/ KENNEDY & ASSOCAccelerating Voltage: 100 KVSample ID: # 15Indicated Mag: 20 -25KX A2Screen Mag: 15414 20KXMAS Job Number: M 2140-15Microscope Number: (1) 2 3Date Sample Analyzed: 31 - Aug - 90Filter Type: MCE PC Other =Filter Size: 25mm, 37mm, (47mm)Number of Openings/Grids Counted: 2.12Filter Pore Size (um): 0.22Grid Accepted, 600X: Yes No 5-10%Grid Opening: 1) 95.3 um x 91.2Analyst: W.P. Smith2) 93.7 um x 93.2Dilution Factor: 1: 1000Calculating Results For Verbal Issue:

Effective Filter Area:

(A) 1339

Number of Grid Openings Examined:

(B) 2

Average Grid Opening Area in sq. mm:

(C) 0.008711

Volume of Liquid Filtered in ml:

(D) 0.1

Area Sampled in Sq. Ft.:

(E) + (0.375)

Number of Asbestos Structures Counted:

(F) 93STRUCTURES PER SQ. FT. FORMULA:

$$\frac{A}{B} \cdot \frac{C}{D} \cdot \frac{100}{E} \cdot F = (\text{asbestos structures per sq. ft.})$$

Calculations:

$$\frac{1339}{2} \cdot \frac{0.008711}{0.1} \cdot \frac{100}{1} \cdot 93 = 1.9 \times 10^{10} \text{ way}$$

CLIENT: LAW ASSOC / KERNESONPAGE # ^{WPS} 3215MAS JOB NUMBER: M-240-15

STR. #	GRID # SQUARE #	TYPE C, A	STRUCTURE F, B, C, M, N	LENGTH MICRONS	WIDTH MICRONS	CONFIRMATION		
						MORPH.	SAED.	EDS.
1	1-1	C	M	8.5	1	✓		PO
2		C	M	7	0.7	✓	✓	
3		C	M	7	3	✓	✓	
4		C	M	12	0.6	✓	✓	
5		C	M	7	7	✓	✓	
6		C	M	26	0.1	✓	✓	
7		C	M	14	5	✓	✓	
8		C	M	8.5	1	✓	✓	
9		C	M	5	2	✓	✓	
10		C	C	11.2	0.8	✓	✓	
11		C	F	3.5	0.1	✓		PO
12		C	M	7.5	2	✓	✓	
13		C	M	3.5	2	✓	✓	
14		C	M	9.5	2.5	✓	✓	
15		C	M	30	7	✓	✓	
16		C	M	3.5	1	✓		✓
17		C	M	13	1.5	✓	✓	
18		C	M	28	0.6	✓	✓	
19		C	M	25	1.2	✓	✓	
20		C	M	14	7	✓	✓	
21		C	M	21.2	0.4	✓		PO
22		C	M	5	1	✓	✓	
23		C	M	4	1	✓	✓	
24		C	M	10	1	✓	✓	
25		C	M	25	25	✓	✓	
26		C	F	7	0.2	✓	✓	
27		C	F	3	0.2	✓	✓	
28		C	M	18	6	✓	✓	
29		C	M	5	1	✓	✓	
30		C	M	27	3.5	✓	✓	

CLIENT:

LAW ASSOC / KENNEDY

PAGE #

WPS
#3
15

MAS JOB NUMBER:

M-240-

STR. #	GRID # SQUARE #	TYPE C, A	STRUCTURE F, B, C, M, N	LENGTH MICRONS	WIDTH MICRONS	CONFIRMATION		
						MORPH.	SAED.	EDS.
31	1-1	C	M	1.5	0.3	✓		P.O.
32		C	M	1.2	0.3	✓	✓	
33		C	M	4	1	✓	✓	
34		C	M	7.5	7.5	✓	✓	
35		C	M	20	4	✓	✓	
36		C	M	10	6	✓	✓	
37		C	M	4	1	✓	✓	
38		C	M	4	3.5	✓	✓	
39		C	M	2	1	✓	✓	
40		C	M	3	0.6	✓	✓	
41		C	M	14	7	✓		PO
42		C	M	X ^{WPS} 13	2	✓	✓	
43		C	M	21	3.5	✓	✓	
44		C	M	4	2	✓	✓	
45		C	M	1.3	0.3	✓	✓	
46		C	M	12	2	✓	✓	
47		C	M	4	3.5	✓	✓	
48		C	M	X ^{WPS} 11	2	✓	✓	
49		C	M	10	2	✓	✓	
50	2-1	C	M	3.5	0.8	✓	✓	
51		C	M	9.5	2	✓		PO
52		C	M	5.5	2	✓	✓	
53		C	M	10.5	2	✓	✓	
54		C	M	35	17	✓	✓	
55		C	F	1.1	0.1	✓	✓	
56		C	M	4.5	1	✓	✓	
57		C	M	7	3.5	✓	✓	
58		C	M	1.9	0.6	✓	✓	
59		C	C	4	0.15	✓	✓	
60		C	M	5	0.6	✓	✓	

CLIENT:

Law Assoc. / KENNEDY

PAGE #

415

AS JOB NUMBER:

M-2140-15

STR. #	GRID # SQUARE #	TYPE C, A	STRUCTURE F, B, C, M, N	LENGTH MICRONS	WIDTH MICRONS	CONFIRMATION		
						MORPH.	SAED.	EDS.
61	2-1	C	M	16	5	✓	✓	P.O.
62		C	F	2.5	0.1	✓	✓	
63		C	F	1.2	0.1	✓	✓	
64		C	M	40	7	✓	✓	
65		C	M	4	1	✓	✓	
66		C	M	14	3	✓	✓	
67		C	F	1.9	0.1	✓	✓	
68		C	F	0.8	0.1	✓	✓	
69		C	M	7	0.6	✓	✓	
70		C	M	4.5	1.5	✓	✓	
71		C	M	11	10	✓	✓	P.O.
72		C	F	2	0.1	✓	✓	
73		C	M	4	2	✓	✓	
74		C	M	1	0.2	✓	✓	
75		C	M	15	5	✓	✓	
76		C	M	3.5	2.5	✓	✓	
77		C	M	20	3	✓	✓	
78		C	F	0.8	0.1	✓	✓	
79		C	M	2.0	1.5	✓	✓	
80		C	M	4	0.4	✓	✓	
81		C	F	3.5	0.1	✓	✓	P.O.
82		C	C	2.0	2.0	✓	✓	
83		C	M	3	0.7	✓	✓	
84		C	F	0.8	0.1	✓	✓	
85		C	M	1.2	0.4	✓	✓	
86		C	M	20	7	✓	✓	
87		C	M	7	5	✓	✓	
88		C	M	8	2	✓	✓	
89		C	F	1.1	0.1	✓	✓	
90		C	M	16	0.4	✓	✓	

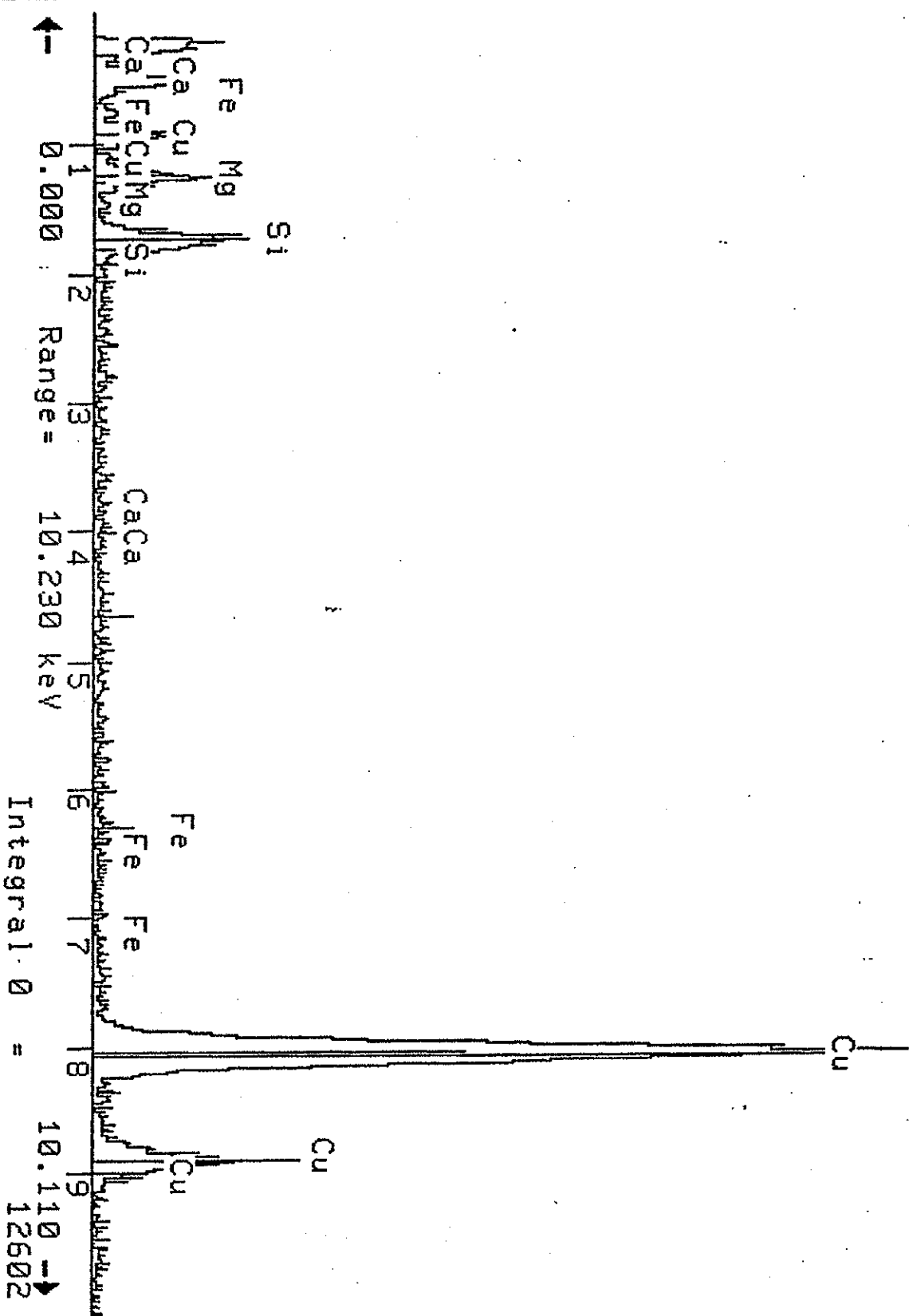
AS JOB NUMBER: M- 2140-13

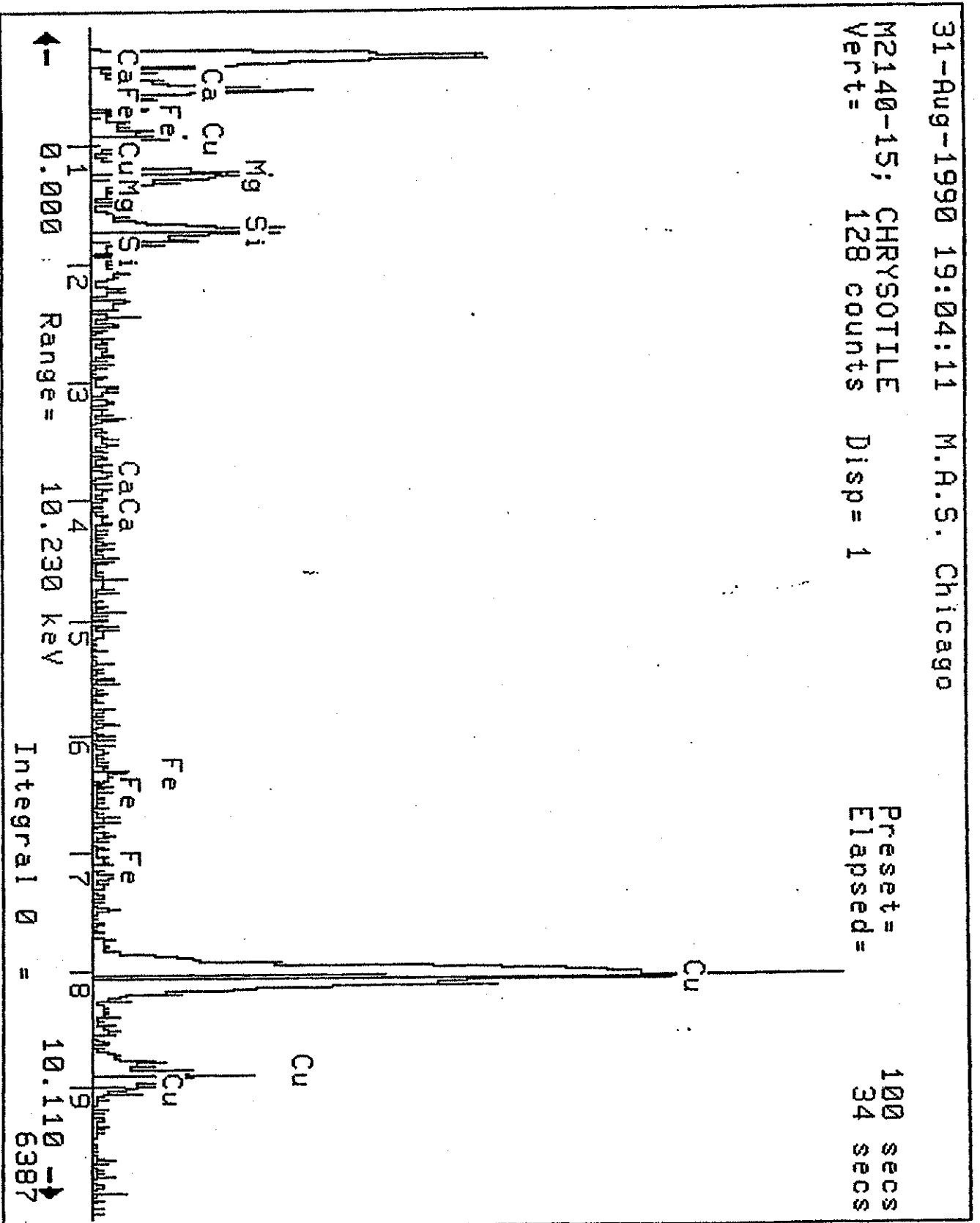
[illegible]

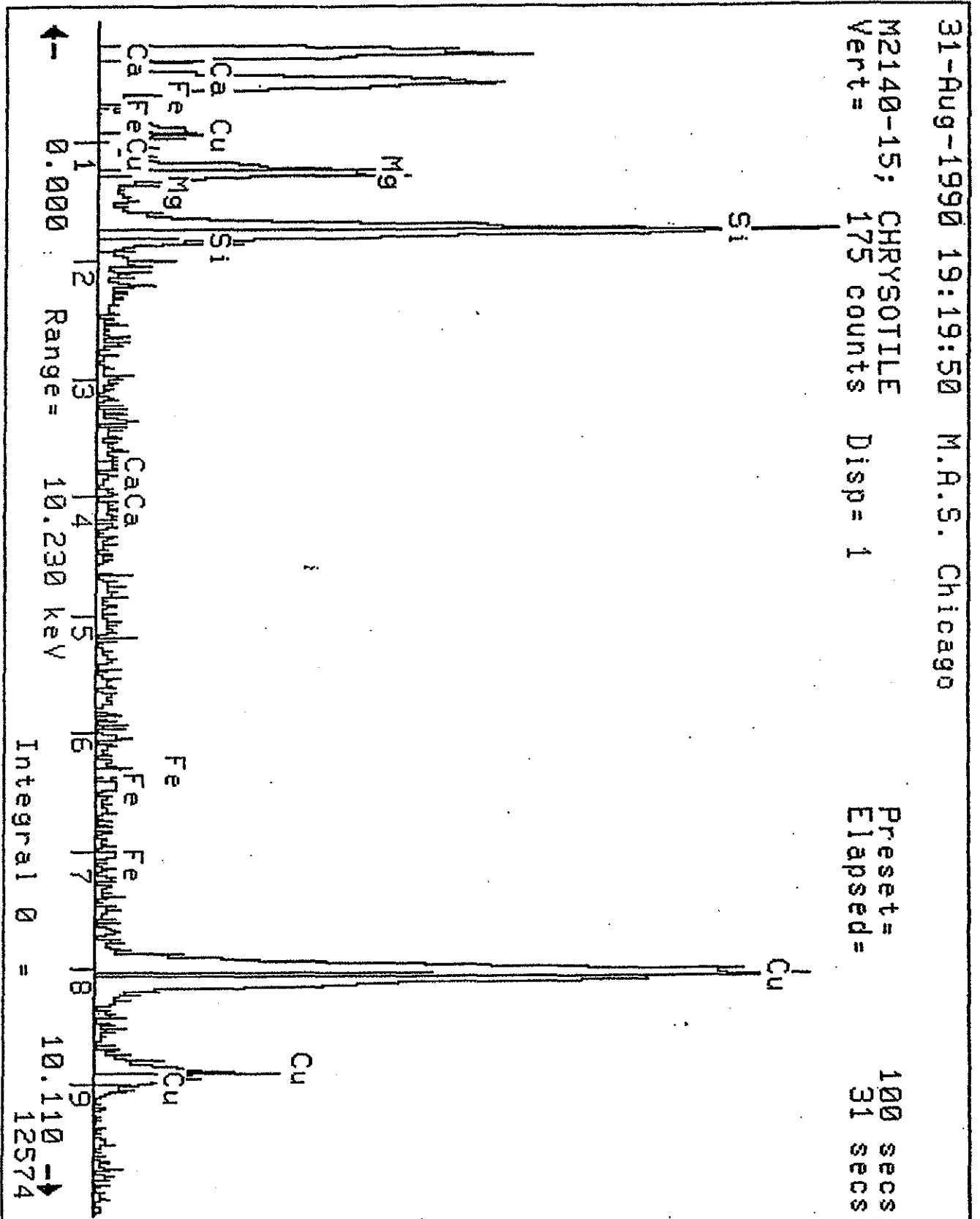
31-Aug-1990 18:49:59 M.A.S. Chicago

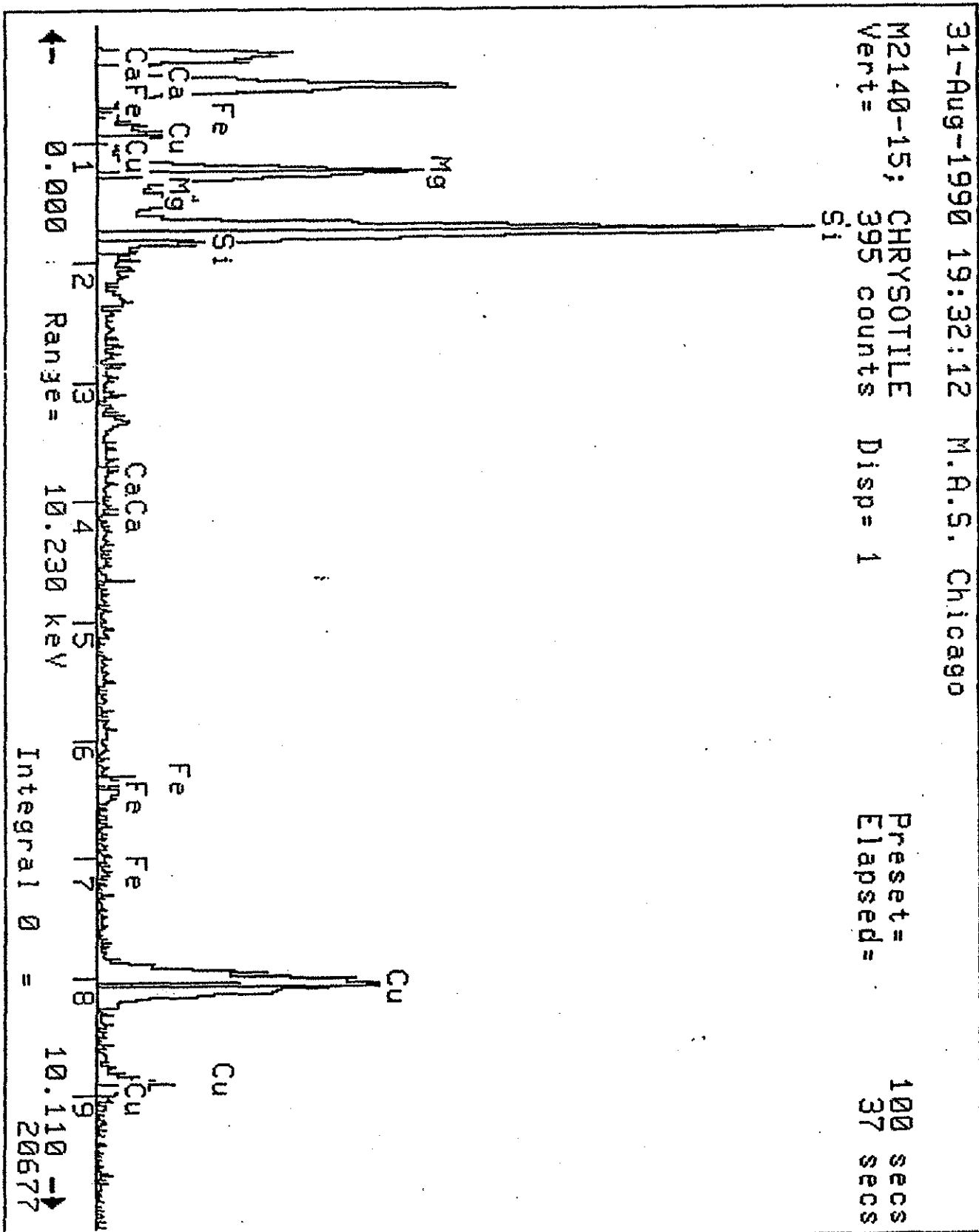
M2140-15; CHRYSOTILE
Vert = 318 counts Disp = 1

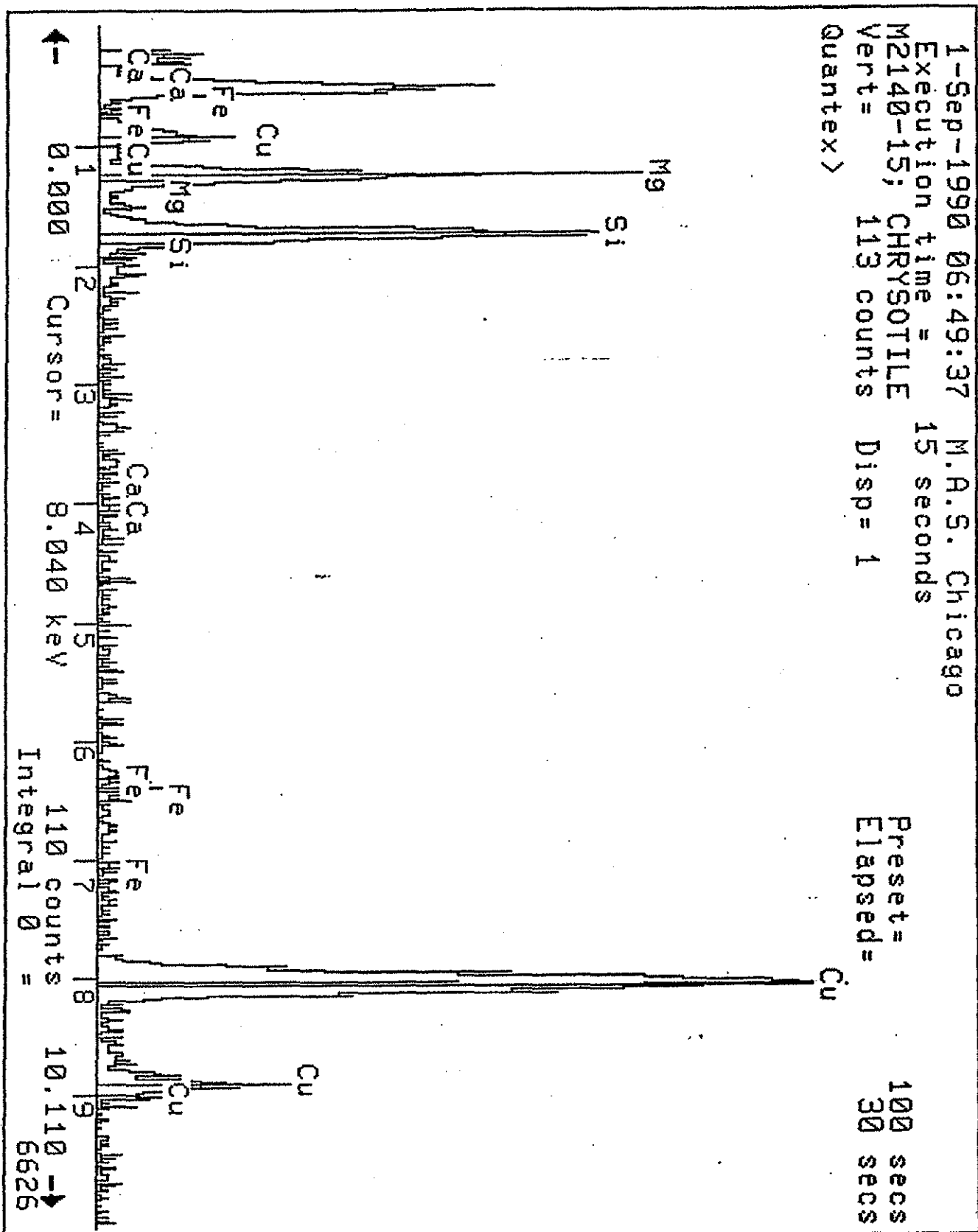
Preset = 100 secs
Elapsed = 31 secs

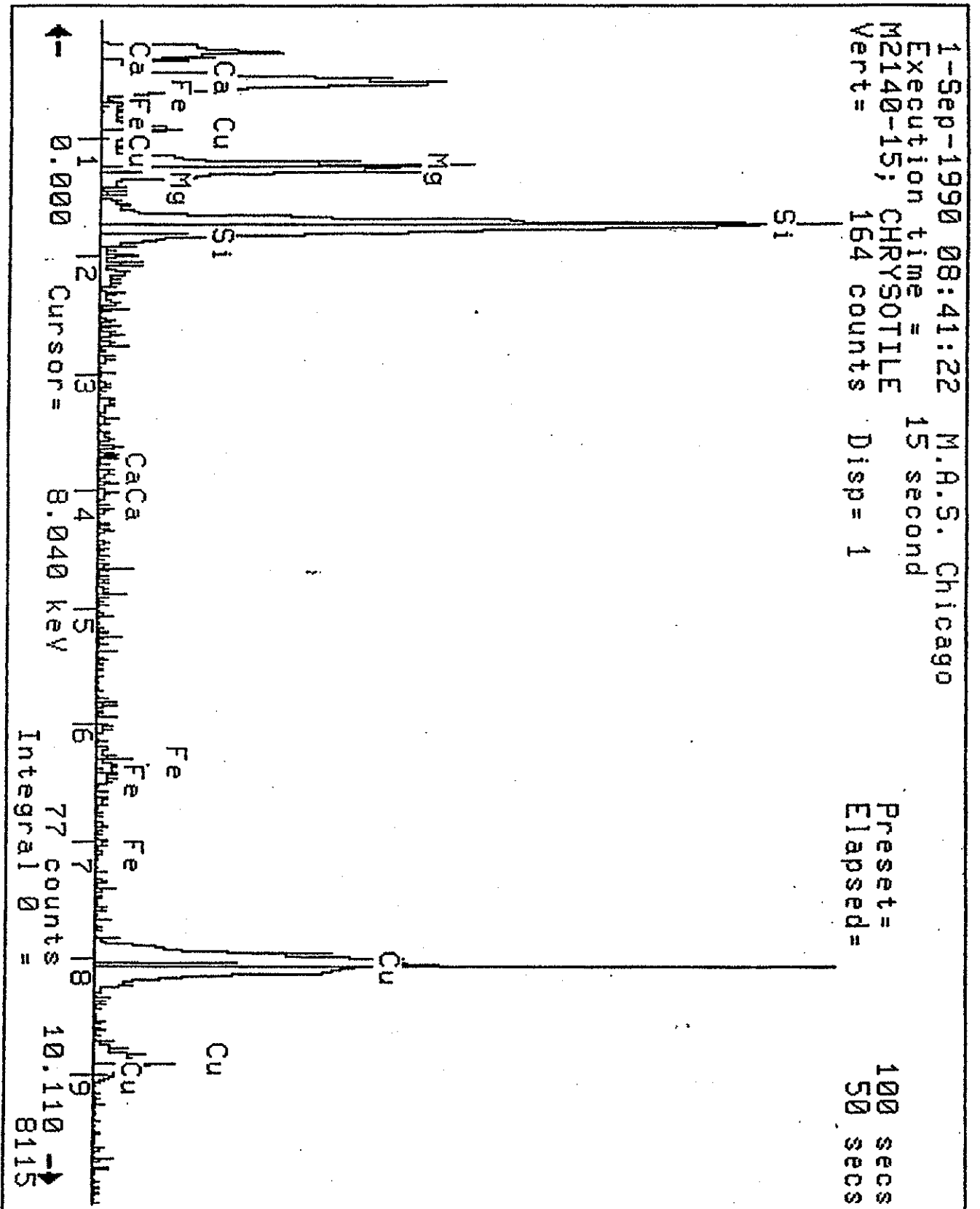


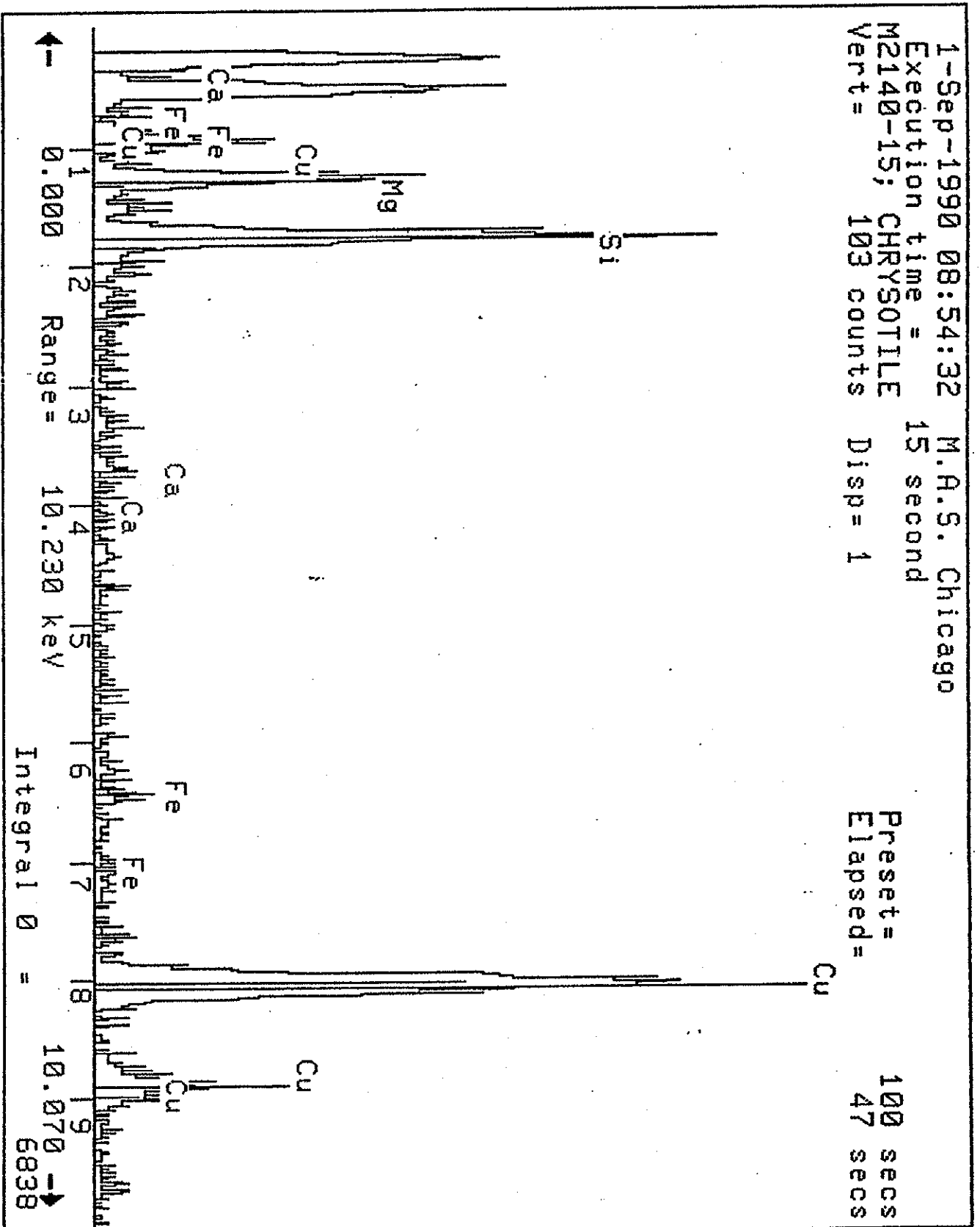


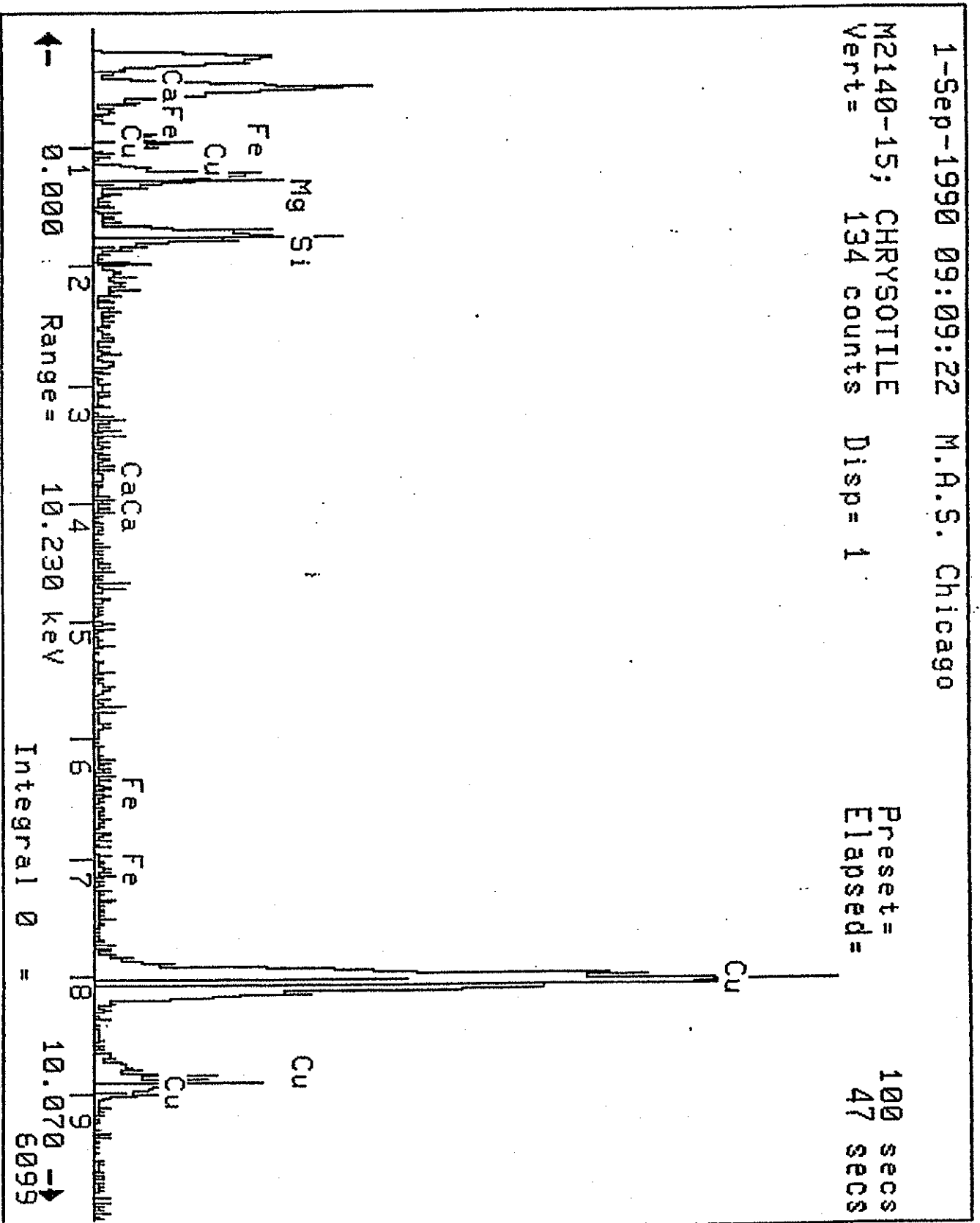


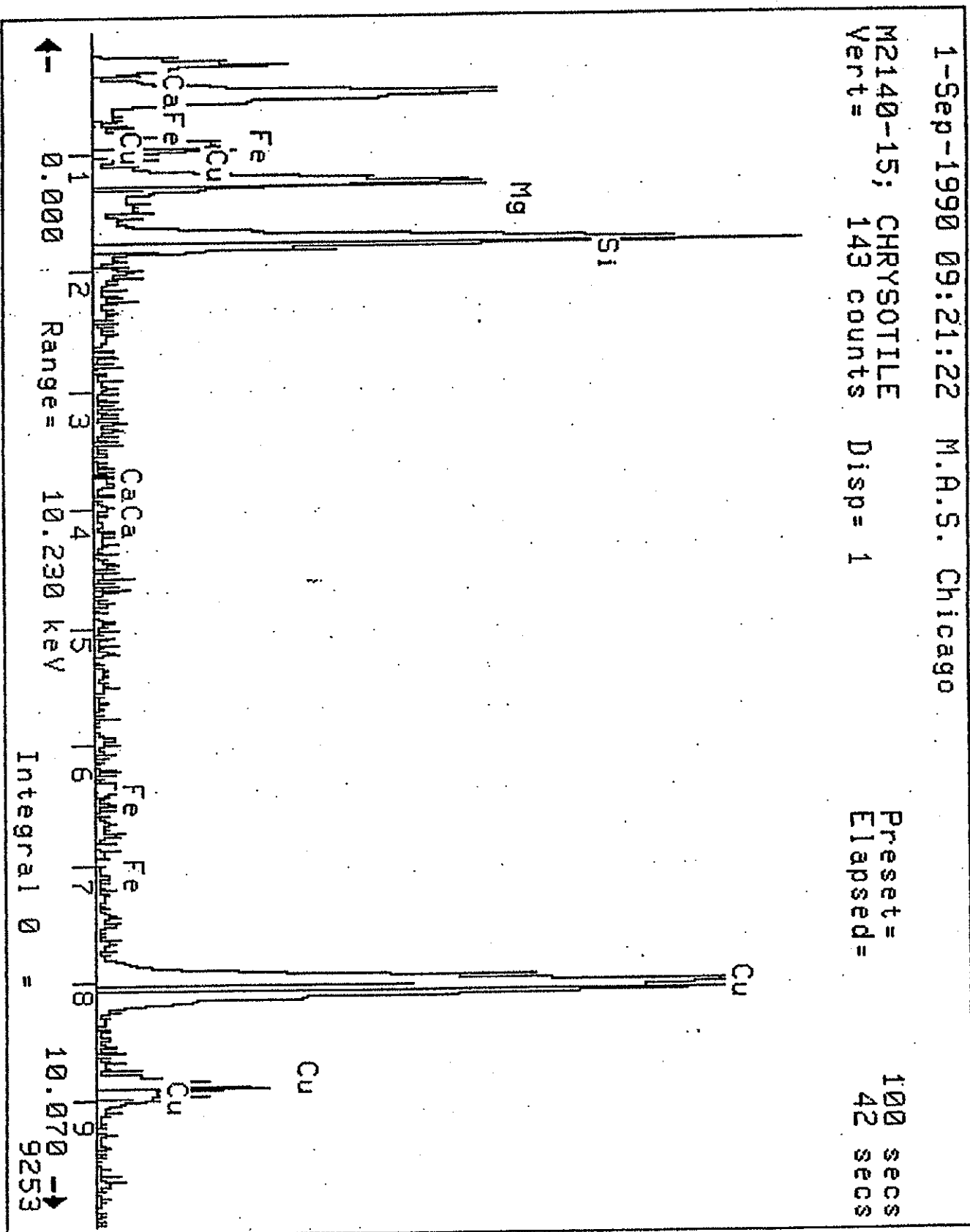












DUPLICATE: 1111

REPLICATE: _____

PAGE # 114MAS JOB NUMBER: M - 2140-15 0.1µ# of GO/grids counted: 1

Ave. grid opening: _____ sq. µm.

E: 9-19-90Grid opening: 1) 90 µm X 88.5 µm
2) 99 µm X 93.7 µmANALYST: Orig: W.S. I.C.F.O.

STR. #	GRID # SQUARE #	TYPE C, A	STRUCTURE F, B, C, M, N	LENGTH MICRONS	WIDTH MICRONS	CONFIRMATION		
						MORPH.	SAED.	EDS.
1	1-1	C	F	16	0.2	✓	✓	P.D.
2		C	F	9.	0.1	✓	✓	
3		C	F	9.5	0.2	✓	✓	
4		C	F	1.5	0.1	✓	✓	
5		C	F	7.0	0.1	✓	✓	
6		C	F	1.3	0.1	✓	✓	
7		C	F	7.0	0.1	✓	✓	
8		C	F	4.5	0.1	✓	✓	
9		C	F	17.0	0.1	✓	✓	
10		C	F	1.5	0.1	✓	✓	P.D.
11		C	F	1.2	0.1	✓	✓	
12		C	F	9.0	0.1	✓	✓	
13		C	F	25.0	0.1	✓	✓	
14		C	F	2.0	0.1	✓	✓	
15		C	F	6.0	0.1	✓	✓	
16		C	F	14.0	0.1	✓	✓	
17		C	B	2.5	0.3	✓	✓	
18		C	F	4.0	0.1	✓	✓	
19	1-2	C	F	3.5	0.1	✓	✓	
20		C	F	2.0	0.1	✓	✓	P.D.
21		C	F	6.0	0.1	✓	✓	
22		C	B	10.0	0.4	✓	✓	
23		C	C	3.0	0.3	✓	✓	
24		C	F	6.0	0.1	✓	✓	
25		C	M	7.0	5.0	✓	✓	
26		C	F	3.5	0.1	✓	✓	
27		C	B	2.5	0.3	✓	✓	
28		C	F	12.0	0.1	✓	✓	

DUPLICATE: 111REPLICATE: PAGE # 214MAS JOB NUMBER: M 2140-15# of GO/grids counted: 1Ave. grid opening:

sq. um.

DATE: 9-19-90Grid opening: 1) um

X

um

2) um

X

um

ANALYST: Orig: W.S. 1

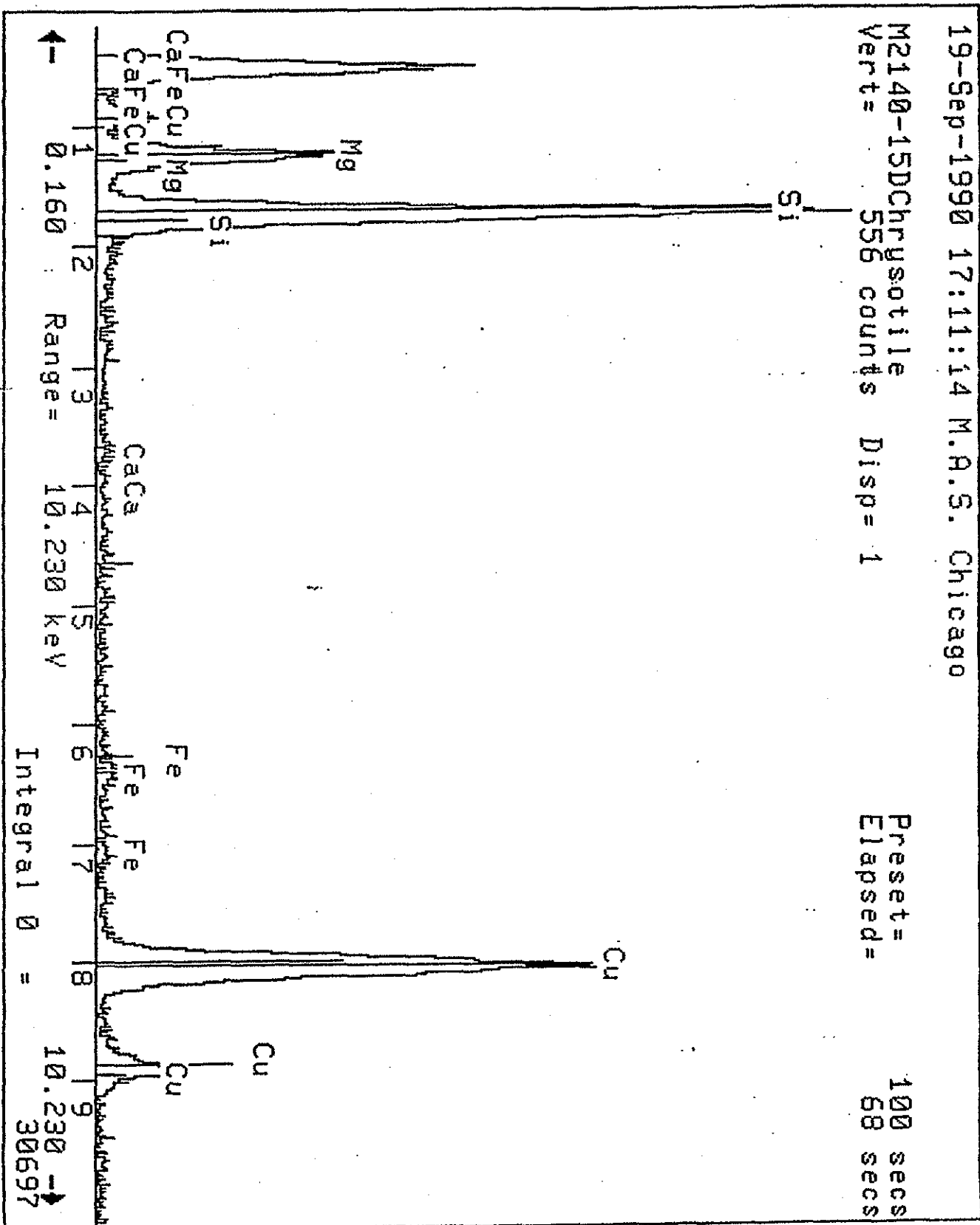
STR. #	GRID # SQUARE #	TYPE C, A	STRUCTURE F, B, C, M, N	LENGTH MICRONS	WIDTH MICRONS	CONFIRMATION		
						MORPH.	SAED.	EDS.
29	1-2	C	B	2.5	0.3	✓	✓	
30		C	F	9.0	0.1	✓	✓	P.D.
31		C	F	2.5	0.1	✓	✓	
32		C	M	3.0	2.0	✓	✓	
33		C	M	2.5	1.5	✓	✓	
34		C	F	1.2	0.1	✓	✓	
35		C	F	8.5	0.1	✓	✓	
36		C	M	8.0	2.0	✓	✓	
37		C	F	13.0	0.1	✓	✓	
38		C	F	1.2	0.1	✓	✓	
39		C	M	4.0	1.5	✓	✓	
40		C	F	1.5	0.1	✓	✓	P.D.
41		C	F	19.0	0.1	✓	✓	
42		C	F	5.0	0.1	✓	✓	
43		C	F	13.0	0.1	✓	✓	
44		C	C	4.5	1.0	✓	✓	
45		C	B	7.0	0.2	✓	✓	
46		C	C	2.0	2.0	✓	✓	
47	2-1	C	F	3.5	0.2	✓	✓	
48	2-1	C	C	3.0	2.0	✓	✓	
49		C	F	0.7	0.1	✓	✓	
50		C	F	5.0	0.1	✓	✓	P.D.
51		C	M	14.0	1.0	✓	✓	
52		C	M	10.0	10.0	✓	✓	
53		C	F	1.2	0.2	✓	✓	
54		C	F	7.0	0.1	✓	✓	
55		C	M	3.0	0.3	✓	✓	
56		C	F	5.0	0.2	✓	✓	

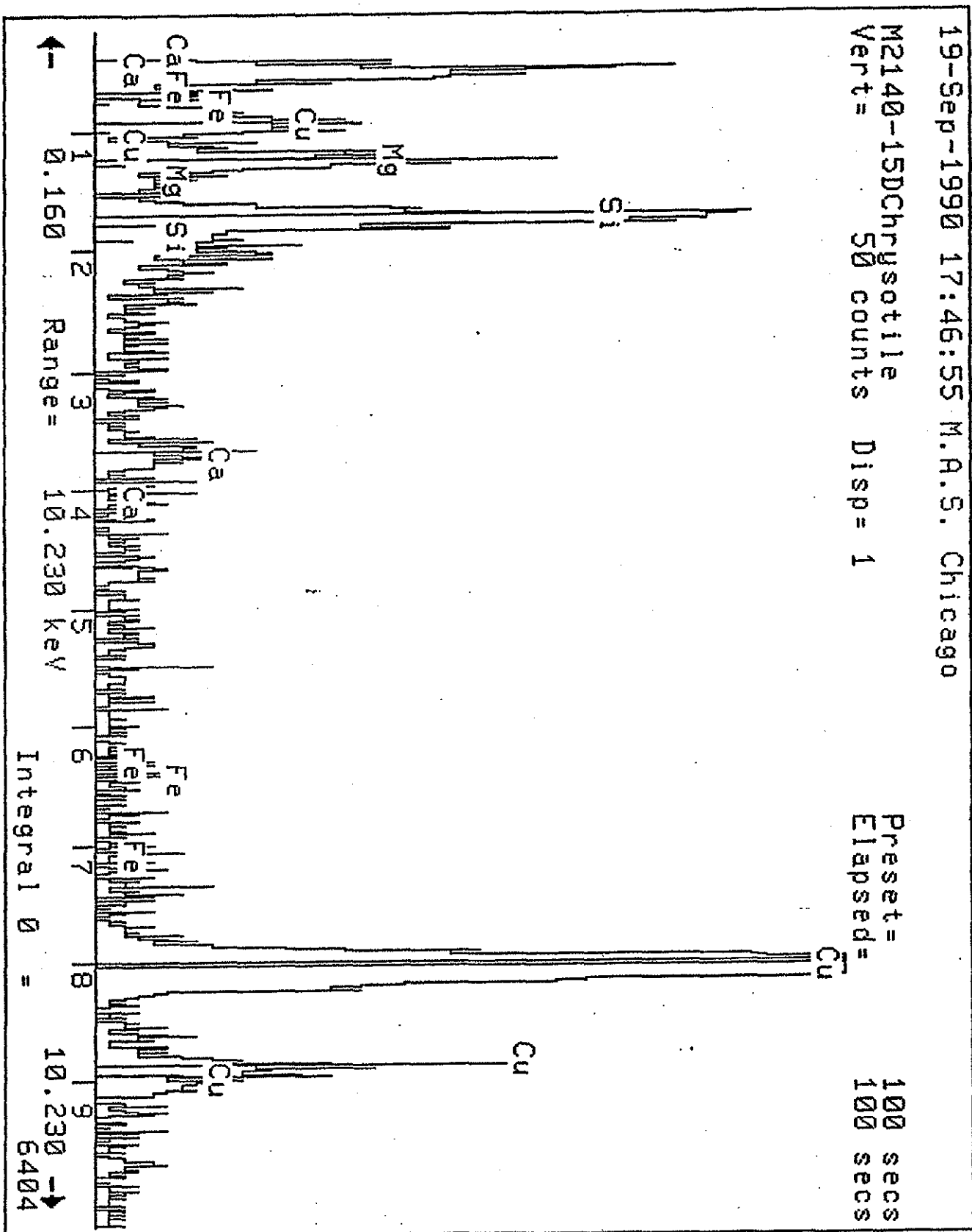
DUPLICATE: 111

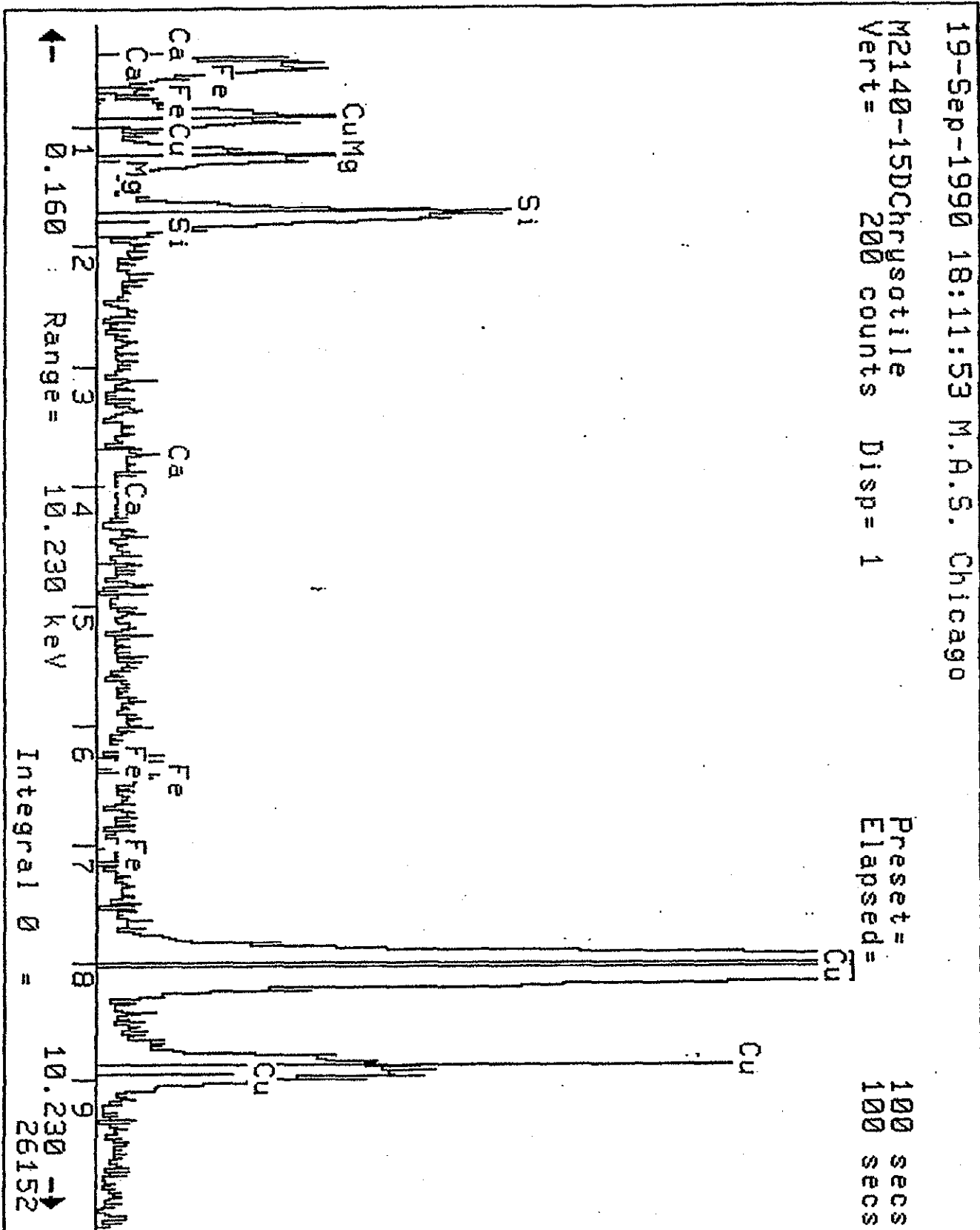
REPLICATE: _____

PAGE # 314MAS JOB NUMBER: M - 2140-15# of GO/grids counted: 1
Ave. grid opening: _____ sq. um.DATE: 9-20-90Grid opening: 1) um X um
2) um X umANALYST: Orig: W. S I

STR. #	GRID # SQUARE #	TYPE C, A	STRUCTURE F, B, C, M, N	LENGTH MICRONS	WIDTH MICRONS	CONFIRMATION		
						MORPH.	SAED.	EDS.
57	2-1	C	M	10.0	7.0	✓	✓	
58		C	M	19.0	2.0	✓	✓	
59		C	M	12.0	4.0	✓	✓	
60		C	F	2.5	0.1	✓	✓	P.D
61		C	F	2.0	0.1	✓	✓	
62		C	M	17.0	10.0	✓	✓	
63		C	F	6.3	0.1	✓	✓	
64		C	M	3.5	0.5	✓	✓	
65		C	M	15.0	10.0	✓	✓	
66		C	F	7.0	0.1	✓	✓	
67		C	M	4.0	2.0	✓	✓	
68		C	M	7.0	2.0	✓	✓	
69		C	F	1.5	0.1	✓	✓	
70		C	M	5.0	2.0	✓	✓	P.D
71		C	M	10.0	2.0	✓	✓	
72		C	C	1.5	1.0	✓	✓	
73		C	F	3.8	0.1	✓	✓	
74		C	M	12.0	4.0	✓	✓	
75		C	F	15.0	0.1	✓	✓	
76		C	M	5.0	3.0	✓	✓	
77		C	B	2.0	0.3	✓	✓	
78		C	F	12.0	0.1	✓	✓	
79		C	M	15.0	2.5	✓	✓	
80		C	M	8.0	1.0	✓	✓	P.D
81		C	F	2.5	0.1	✓	✓	
82		C	M	16.0	3.0	✓	✓	
83		C	M	3.0	1.5	✓	✓	
84		C	M	4.0	2.0	✓	✓	







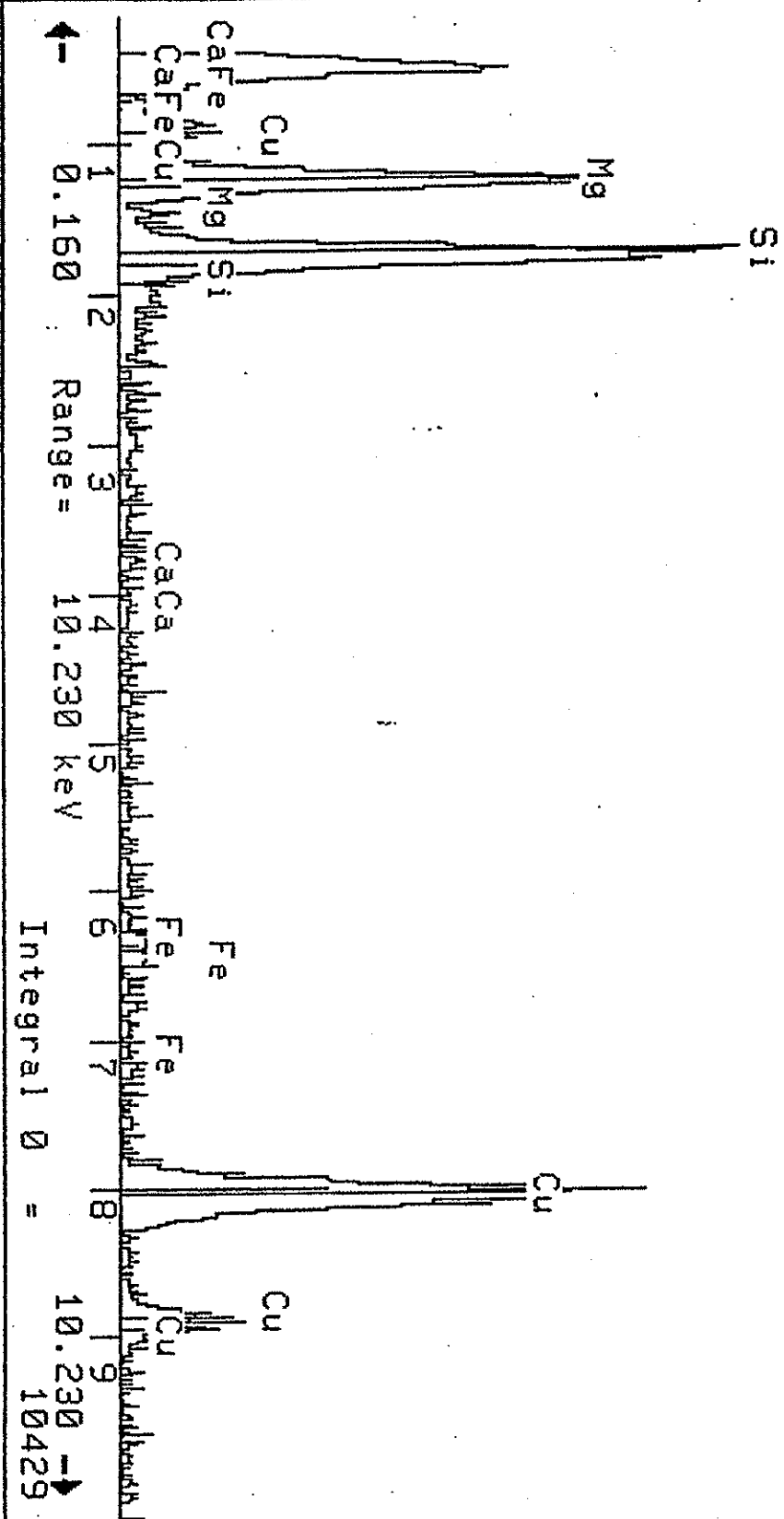
19-Sep-1990 18:36:14 M.A.S. Chicago

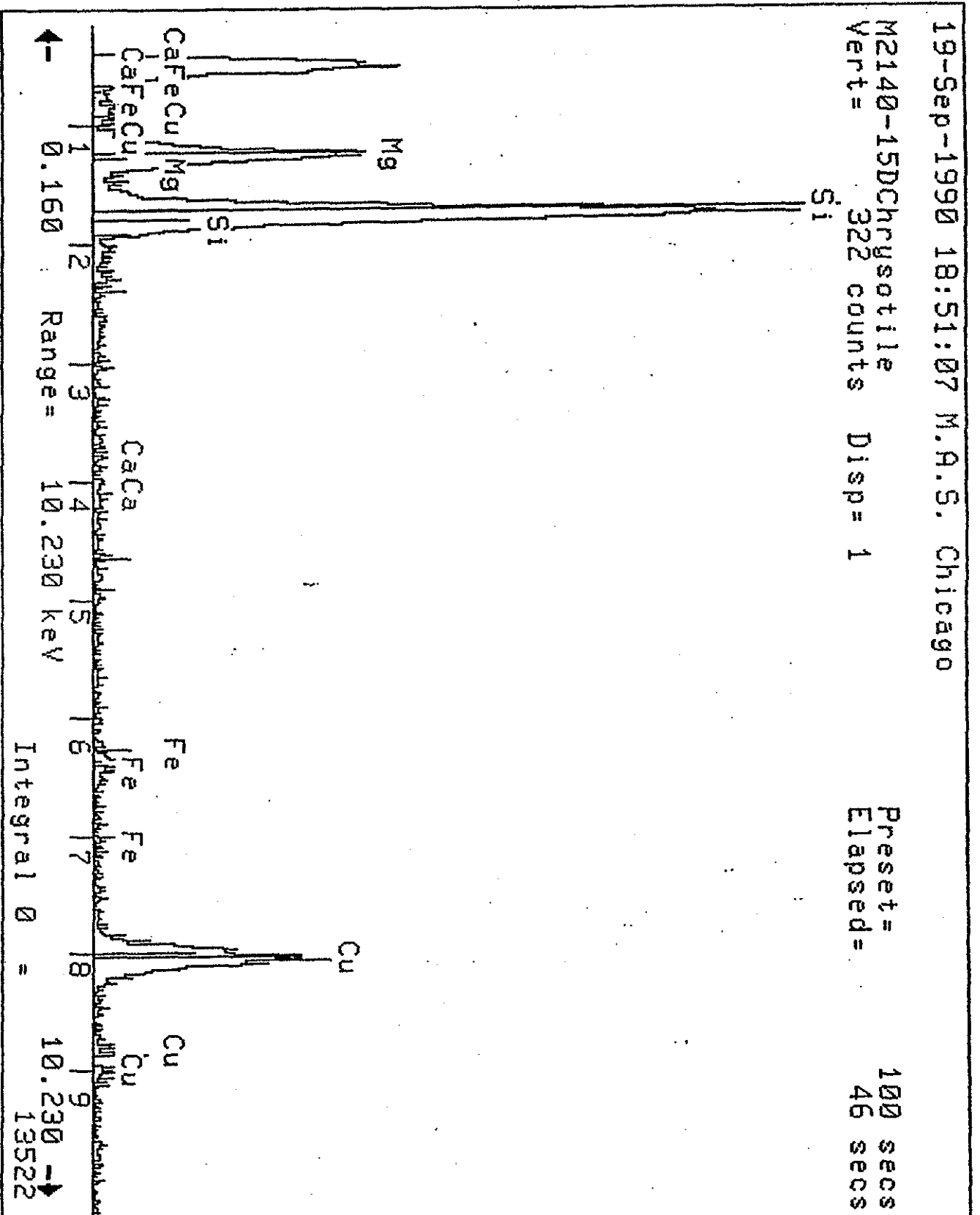
M2140-15DCrystole
Vert = 200 counts

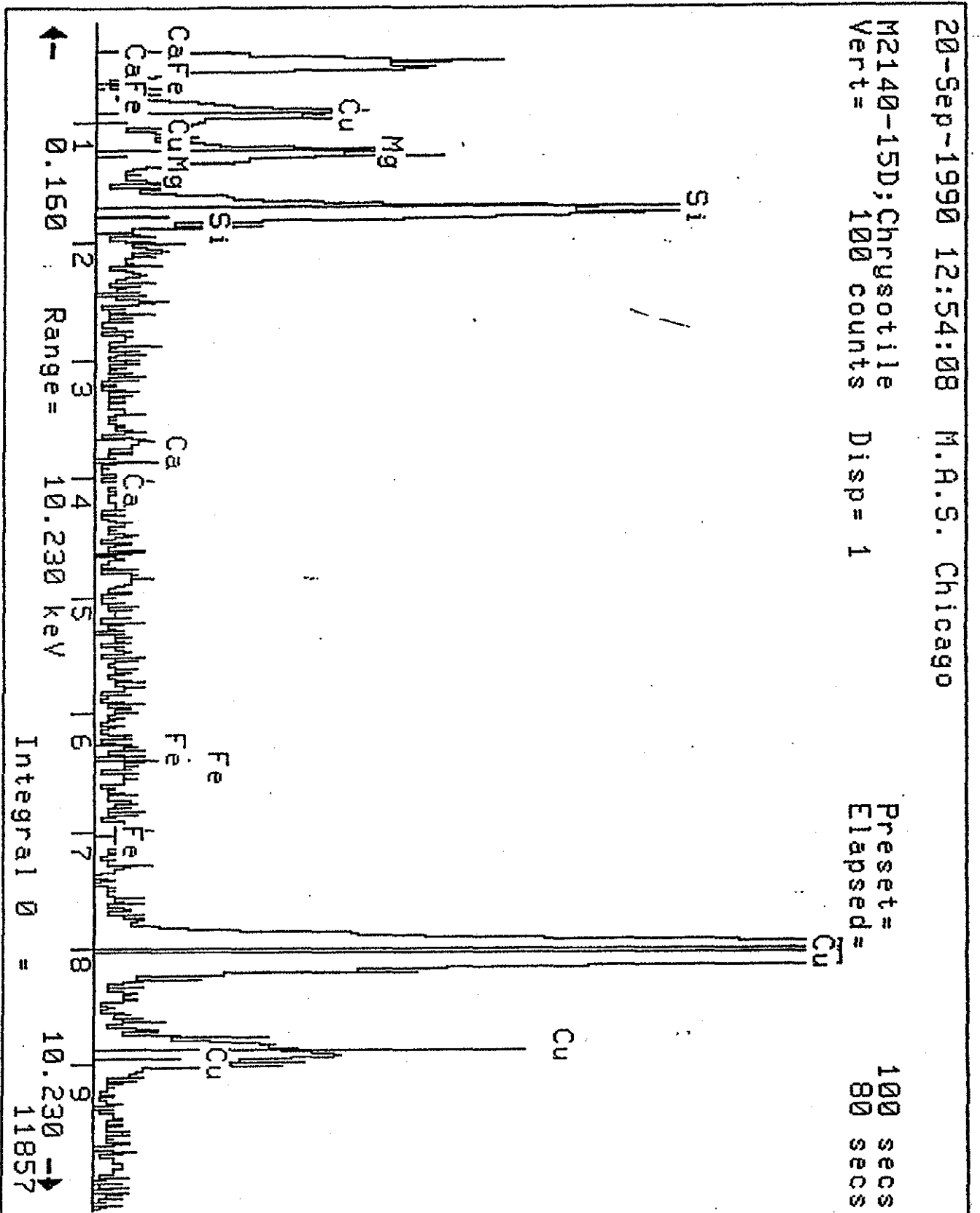
Disp = 1

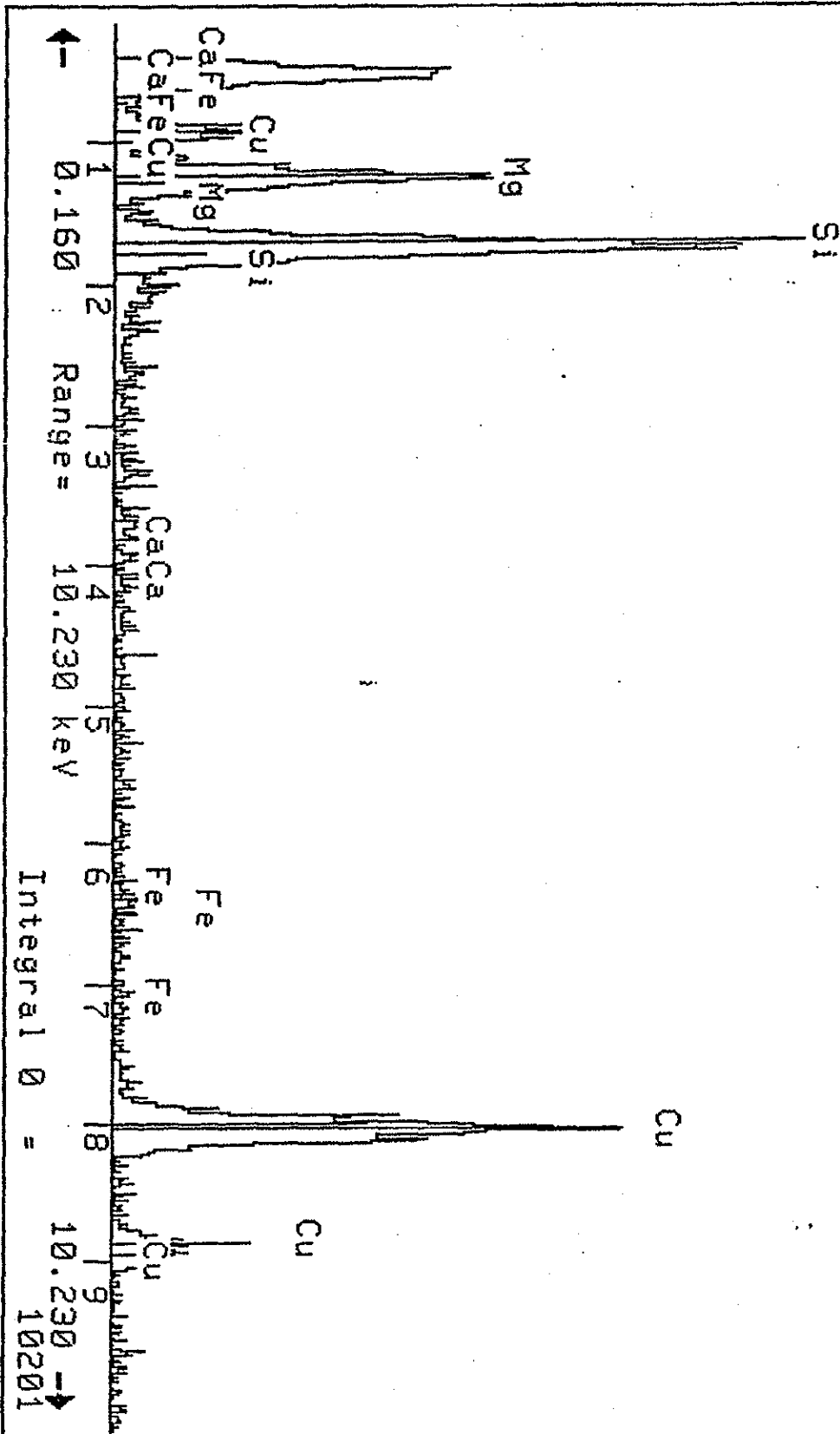
Preset =
Elapsed =

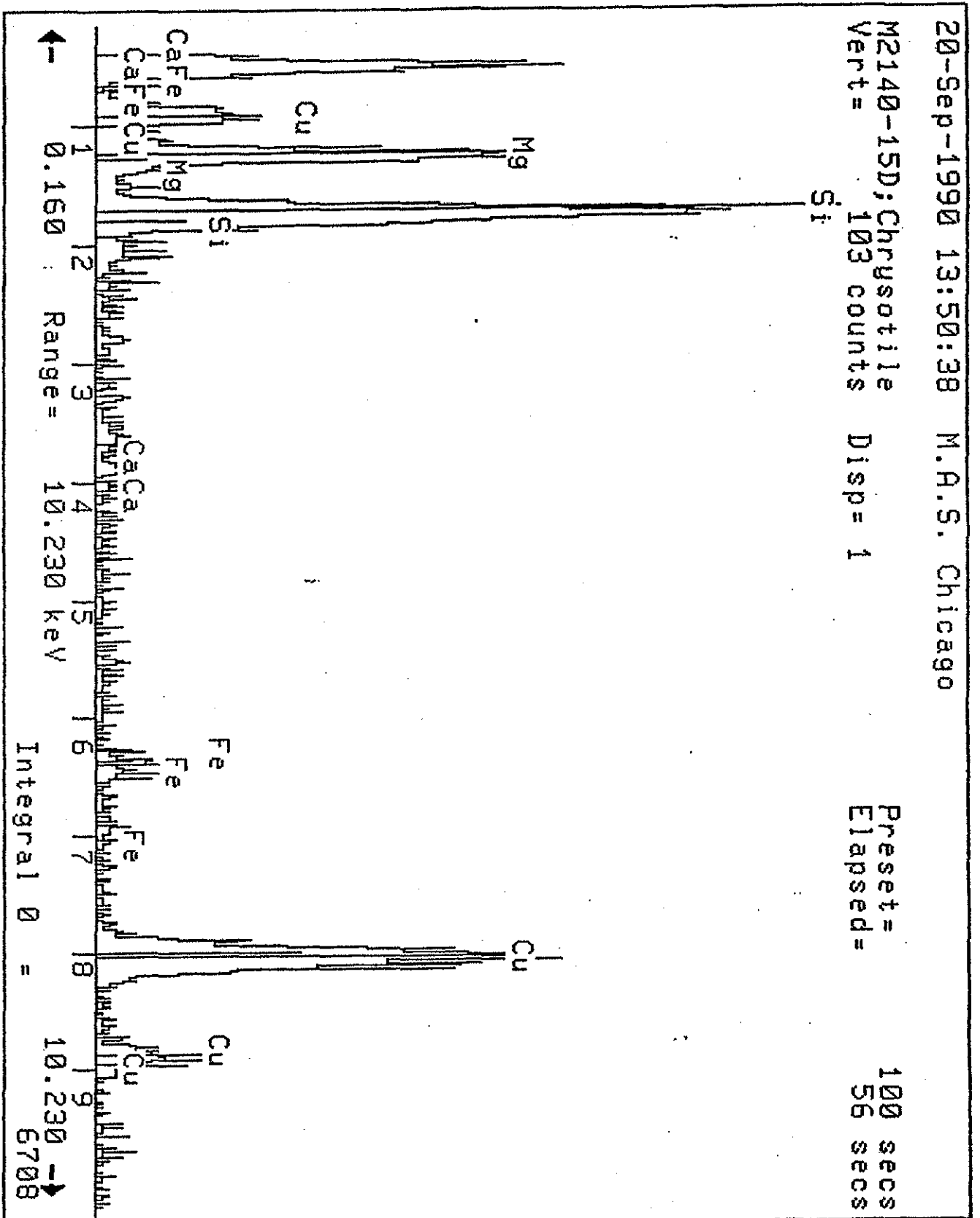
100 secs
100 secs

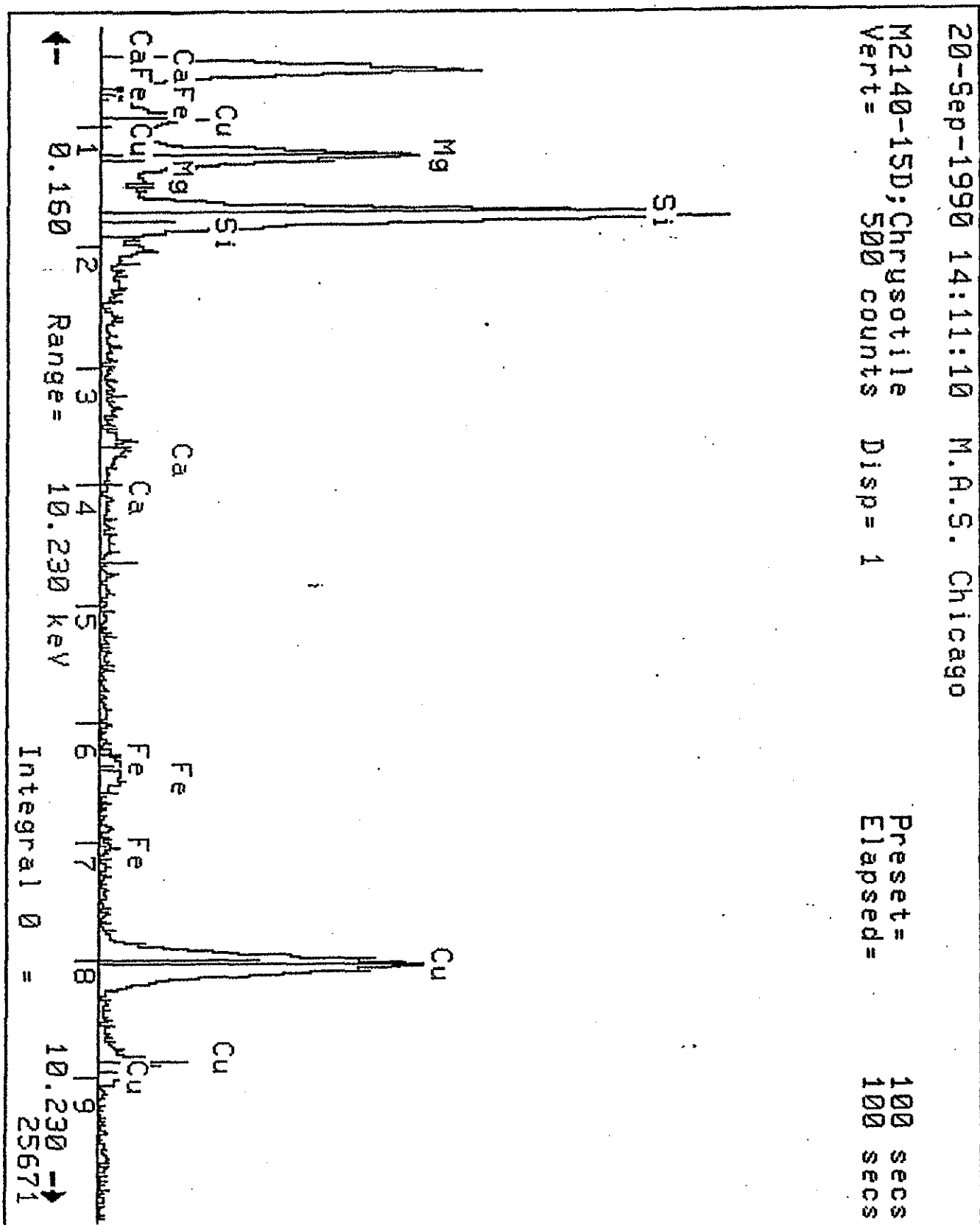












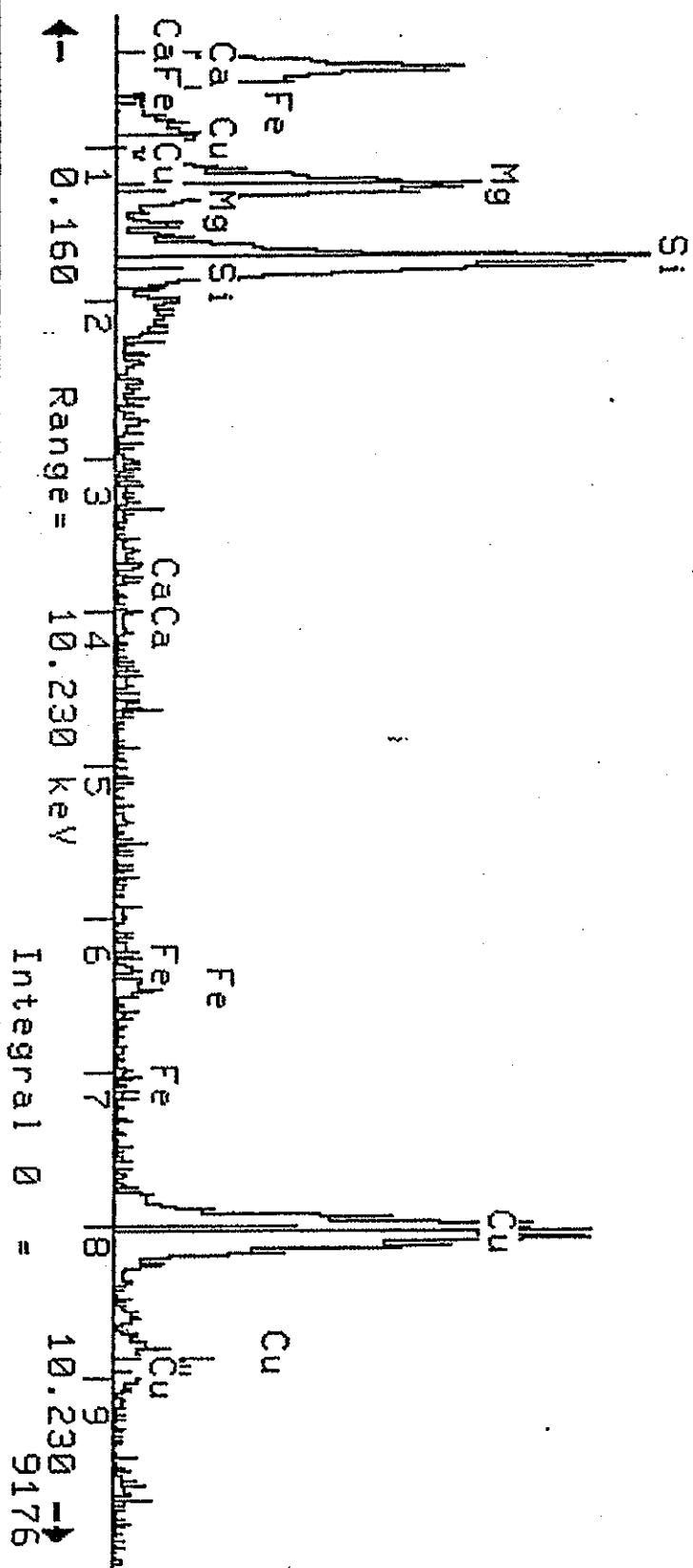
20-Sep-1990 14:41:46 M.A.S. Chicago

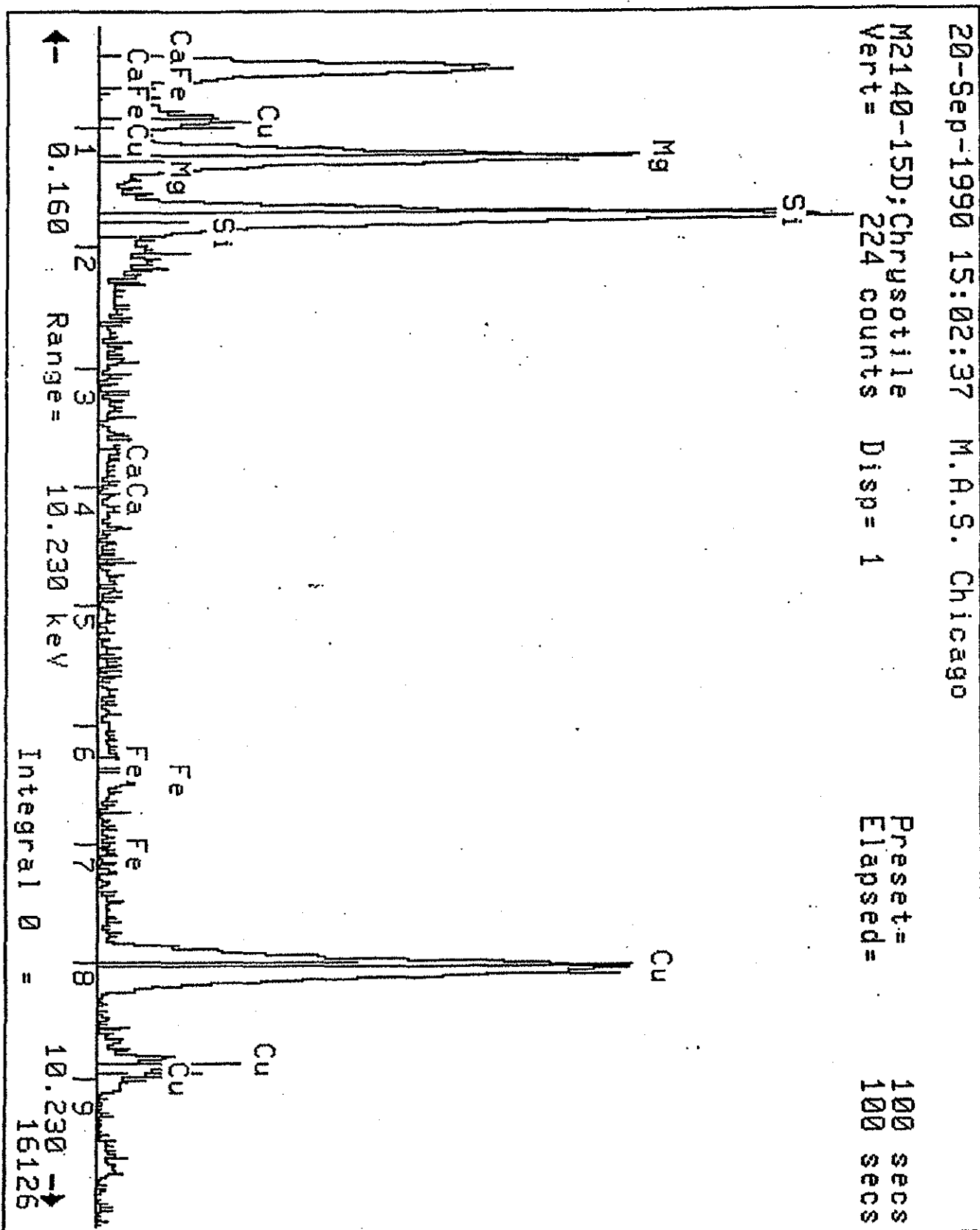
M2140-15D; Chrysotile
Vert = 200 counts

Disp = 1

Preset =
Elapsed =

100 secs
100 secs





MATERIALS ANALYTICAL SERVICES, INC.
DUST SHEETPAGE # 1/1Client: LAW ASSOC / KENNEDY & ASSOCAccelerating Voltage: 100 KVSample ID: #16Indicated Mag: 20 -25KX #2
Screen Mag: 15414 20KXMAS Job Number: M 2140-16Microscope Number: 1 2 3Date Sample Analyzed: 1 -SEP -90Filter Type: MCE PC, Other =Filter Size: 25mm, 37mm, 47mNumber of Openings/Grids Counted: 10.12Filter Pore Size (um): 0.22Grid Accepted, 600X: Yes NoGrid Opening: 1) 96.8 um x 93.7Analyst: W.P. Smith2) 98.9 um x 95.3Dilution Factor: 1: 50Calculating Results For Verbal Issue:

Effective Filter Area:

(A) 1739

Number of Grid Openings Examined:

(B) 10

Average Grid Opening Area in sq. mm:

(C) 0.009248

Volume of Liquid Filtered in ml:

(D) 2

Area Sampled in Sq. Ft.:

(E) 1

Number of Asbestos Structures Counted:

(F) 39STRUCTURES PER SQ. FT. FORMULA:

$$\frac{A}{B} \cdot \frac{C}{D} \cdot \frac{1}{E} \cdot F = (\text{asbestos structures per sq. ft.})$$

Calculations:

$$\frac{1739}{10 \cdot 0.009248} \cdot \frac{100}{2} \cdot \frac{1}{1} \cdot 39 = 2.823 \times 10^7$$

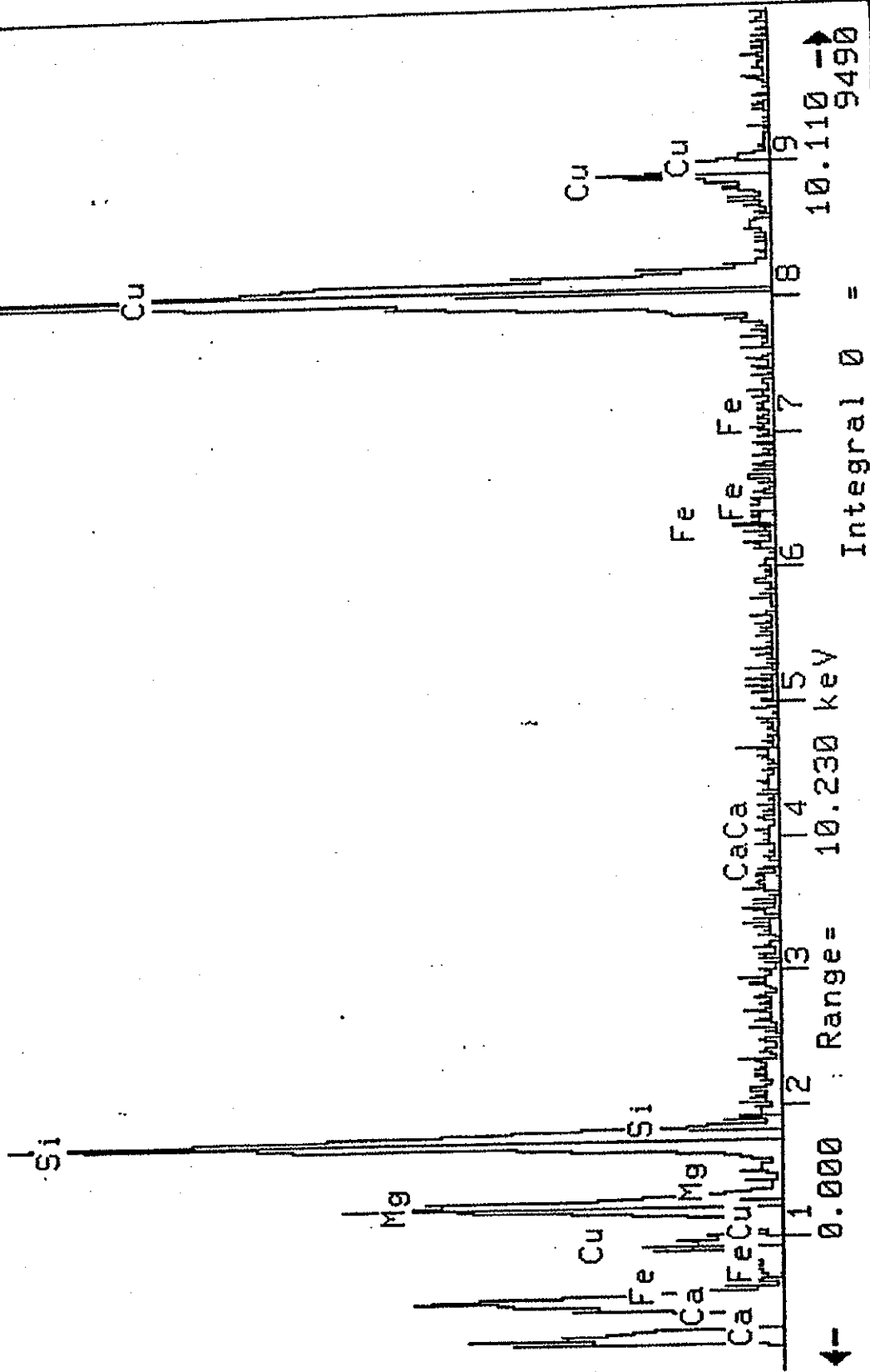
CLIENT: LAW ASSOC / KENNEDYPAGE # 213WAS JOB NUMBER: M-2140-16

STR. #	GRID # SQUARE #	TYPE C, A	STRUCTURE F, B, C, M, N	LENGTH MICRONS	WIDTH MICRONS	CONFIRMATION		
						MORPH.	SAED.	EDS.
1	1-1	C	M	14	1	✓	✓	PO
2		C	F	2.4	0.1	✓	✓	
3		C	F	1.4	0.1	✓	✓	
4		C	F	0.6	0.05	✓	✓	
5		C	F	2.3	0.1	✓	✓	
6		C	B	1.9	0.3	✓	✓	
7	1-2	C	F	1.4	0.1	✓	✓	
8		C	B	1.4	0.15	✓	✓	
9		C	F	1.5	0.1	✓	✓	
10		C	F	2.5	0.3	✓	✓	
11		C	F	1.3	0.1	✓	✓	PO
12	1-3	C	F	2.2	0.1	✓	✓	
13		C	F	1.8	0.1	✓	✓	
14		C	B	8.5	0.5	✓	✓	
15	1-4	C	M	3.8	1.6	✓	✓	
16		C	F	1.4	0.15	✓	✓	
17		C	F	1.5	0.1	✓	✓	
18		C	F	3.4	0.1	✓	✓	
19		C	F	3.4 2.4	0.15	✓	✓	
20	1-5	C	F	1.6	0.1	✓	✓	
21		C	F	1.4	0.1	✓	✓	PO
22		C	F	1.0	0.15	✓	✓	
23	2-1	C	F	1.6	0.15	✓	✓	
24		C	F	1.6	0.2	✓	✓	
25	2-2	C	F	2.8	0.15	✓	✓	
26		C	F	1.0	0.1	✓	✓	
27		C	F	1.0	0.1	✓	✓	
28		C	M	1.5	0.2	✓	✓	
29	2-3	C	B	2.3 2.5	0.3	✓	✓	
30		C	C	2.5	0.6	✓	✓	

1-Sep-1990 10:02:39 M.A.S. Chicago

M2140-16; CHRYSOTILE
Vert= 156 counts Disp= 1

Preset= 100 secs
Elapsed= 41 secs

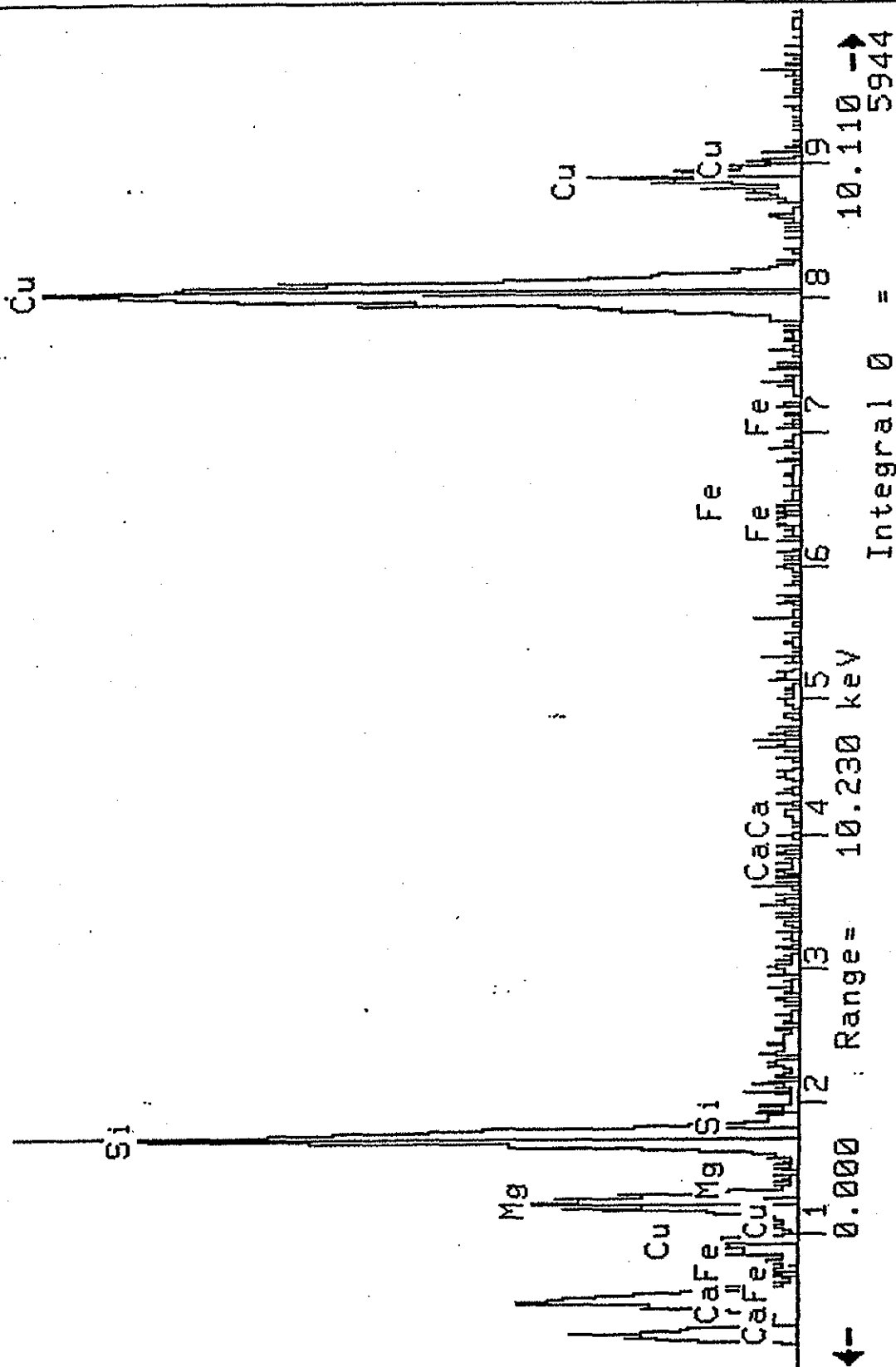


1-Sep-1990 10:22:39 M.A.S. Chicago

M2140-16; CHRYSOTILE

Vert= 106 counts Disp= 1

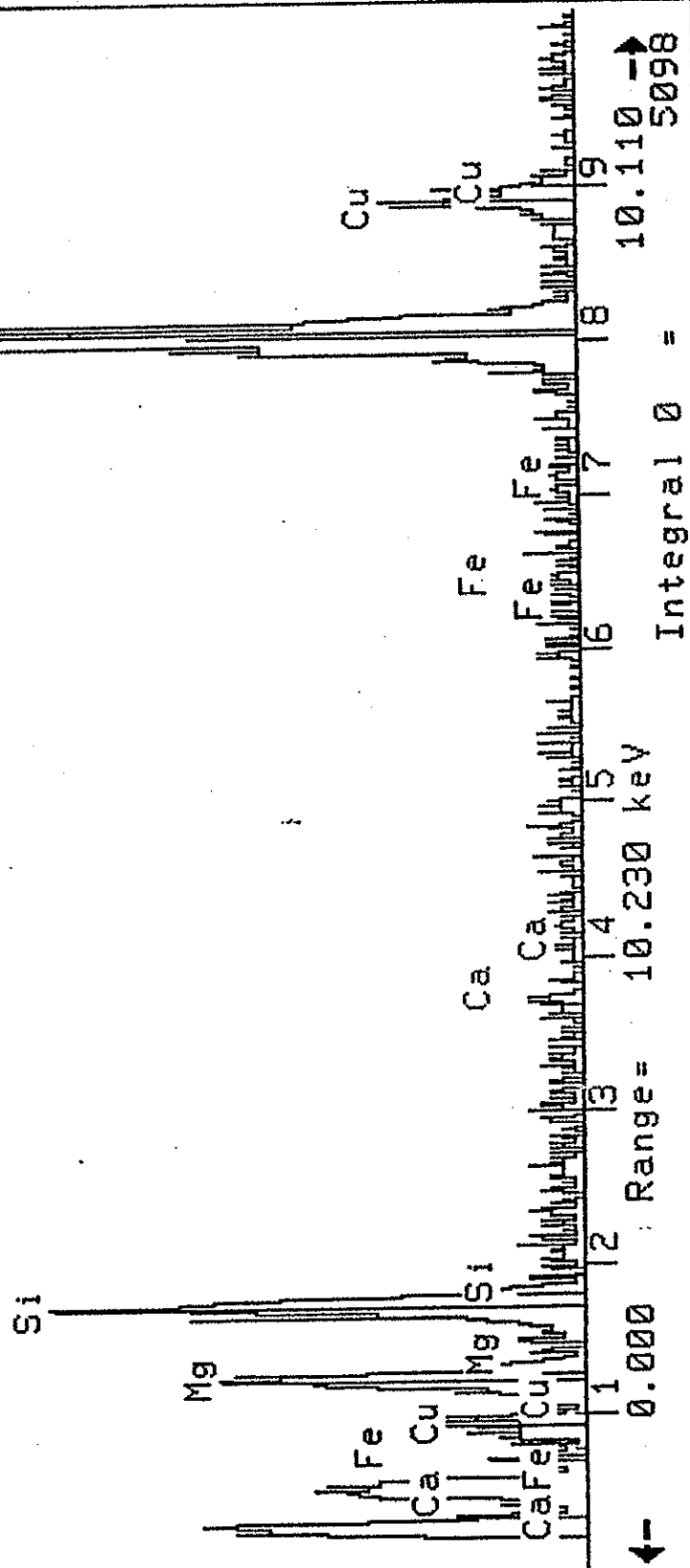
Preset= 100 secs
Elapsed= 32 secs



1-Sep-1990 10:44:23 M.A.S. Chicago

M2140-16; CHRYSOTILE
Vert= 88 counts Disp= 1

Preset= 100 secs
Elapsed= 34 secs



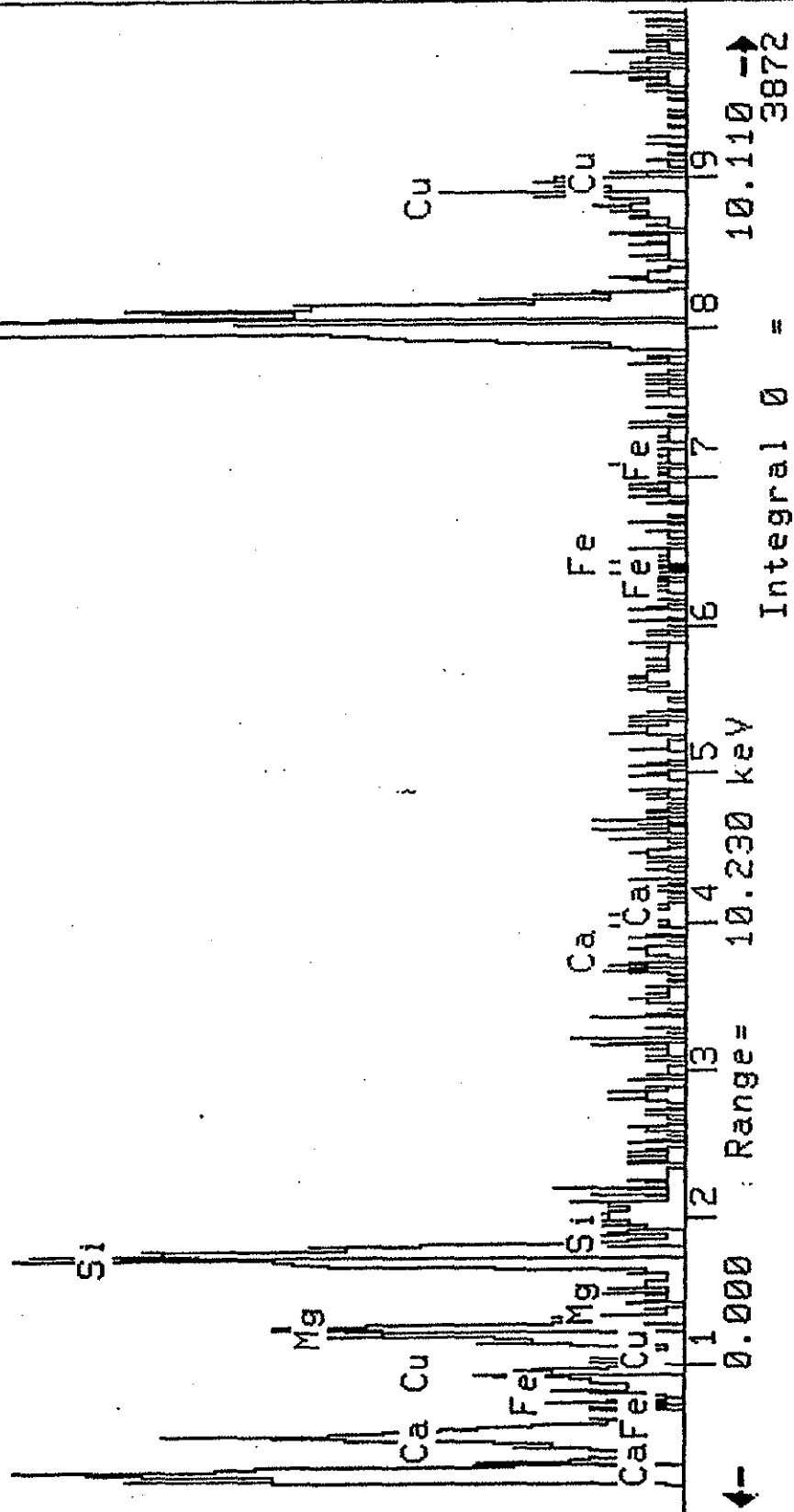
1-Sep-1990 11:19:16 M.A.S. Chicago

M2140-16; CHRYSOTILE
Vert= 50 counts

Disp= 1

Preset=
Elapsed=

100 secs
33 secs



MATERIALS ANALYTICAL SERVICES, INC.
DUST SHEETPAGE # 1Client: LAW ASSOC / KENNEDY & ASSNAccelerating Voltage: 100 KVSample ID: # 17Indicated Mag: 20 -25KX
Screen Mag: 15414 20KXMAS Job Number: M 2140-17Microscope Number: (1) 2 3Date Sample Analyzed: 2 -SEP -90Filter Type: MCE PC, Other =Filter Size: 25mm, 37mm, (47mm)Number of Openings/Grids Counted: 10 1 2Filter Pore Size (um): 0.22Grid Accepted, 600X: Yes 15% NoGrid Opening: 1) 98.2 um x 93.Analyst: W. P. Smith2) 97.3 um x 93.Dilution Factor: 1: 6067 (1.66)Calculating Results For Verbal Issue:

Effective Filter Area:

(A) 1739

Number of Grid Openings Examined:

(B) 10

Average Grid Opening Area in sq. mm:

(C) 0.008858

Volume of Liquid Filtered in ml:

(D) 15

Area Sampled in Sq. Ft.:

(E) 1

Number of Asbestos Structures Counted:

(F) 3STRUCTURES PER SQ. FT. FORMULA:

$$\frac{A}{B \cdot C} \cdot \frac{100}{D} \cdot \frac{1}{E} \cdot F = (\text{asbestos structures per sq. ft.})$$

Calculations:

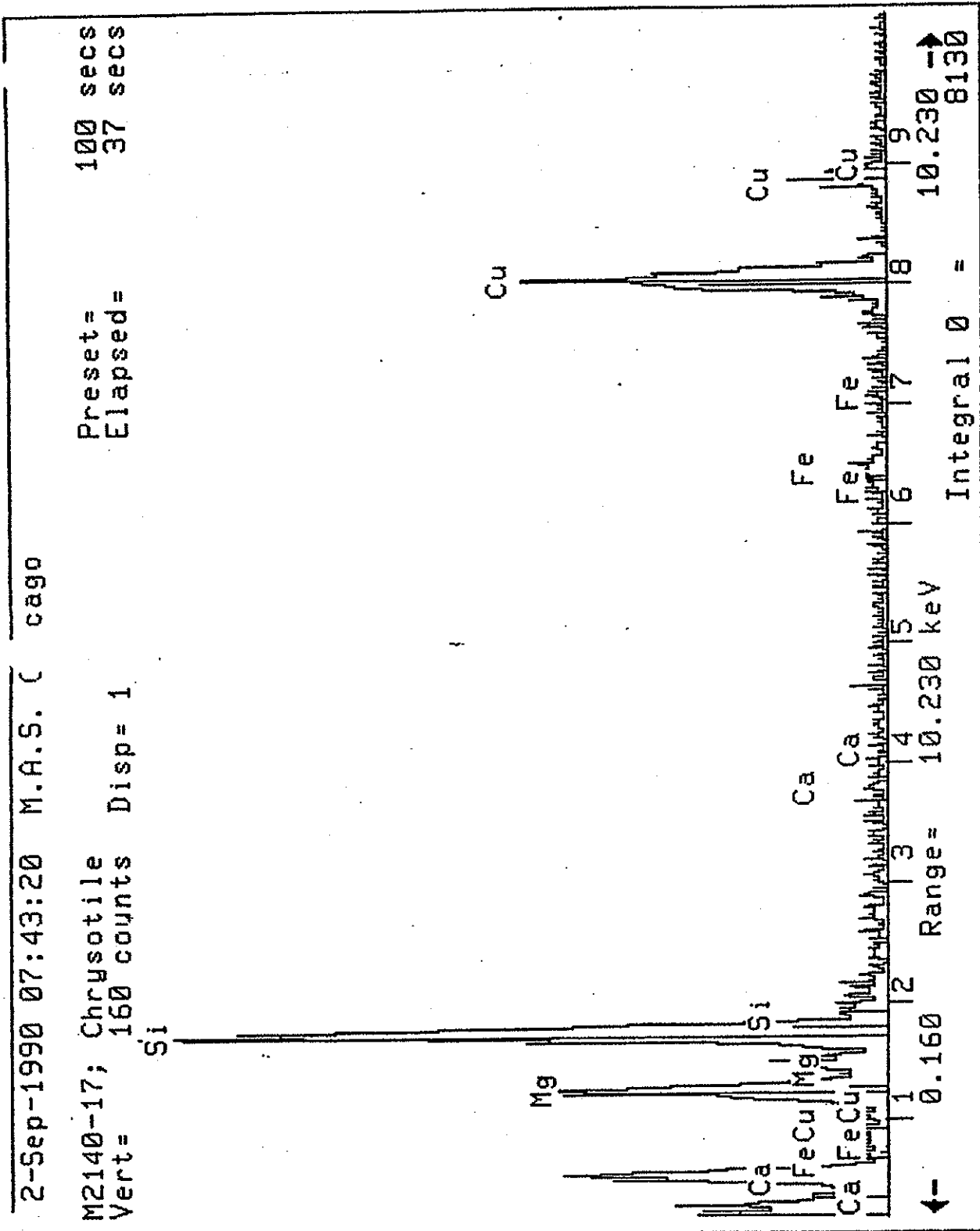
$$\frac{1739}{10 \cdot 0.008858} \cdot \frac{100}{15} \cdot \frac{1}{1} \cdot 3 = 3.023 \cdot 10^5$$

PAGE # 21

MAS JOB NUMBER:

M-240-17

[illegible]



MATERIALS ANALYTICAL SERVICES, INC.
DUST SHEETPAGE # 11Client: LAW ASSOC/ KENNEDYAccelerating Voltage: 100 KVSample ID: # 18Indicated Mag: 20 -25KX
Screen Mag: 15414 20KXMAS Job Number: M 2140-18Microscope Number: 1 2 3Date Sample Analyzed: 1 - SEP - 90Filter Type: MCE PC, Other =Filter Size: 25mm, 37mm, 47mmNumber of Openings/Grids Counted: 10.12Filter Pore Size (um): 0.22Grid Accepted, 600X: Yes 15% NoGrid Opening: 1) 94.0 um x 93.7Analyst: W.P. Smith2) 87.6 um x 91.7Dilution Factor: 1: 0.550 MCalculating Results For Verbal Issue:

Effective Filter Area:

(A) 1339

Number of Grid Openings Examined:

(B) 10

Average Grid Opening Area in sq. mm:

(C) 0.008418

Volume of Liquid Filtered in ml:

(D) 2

Area Sampled in Sq. Ft.:

(E) 1

Number of Asbestos Structures Counted:

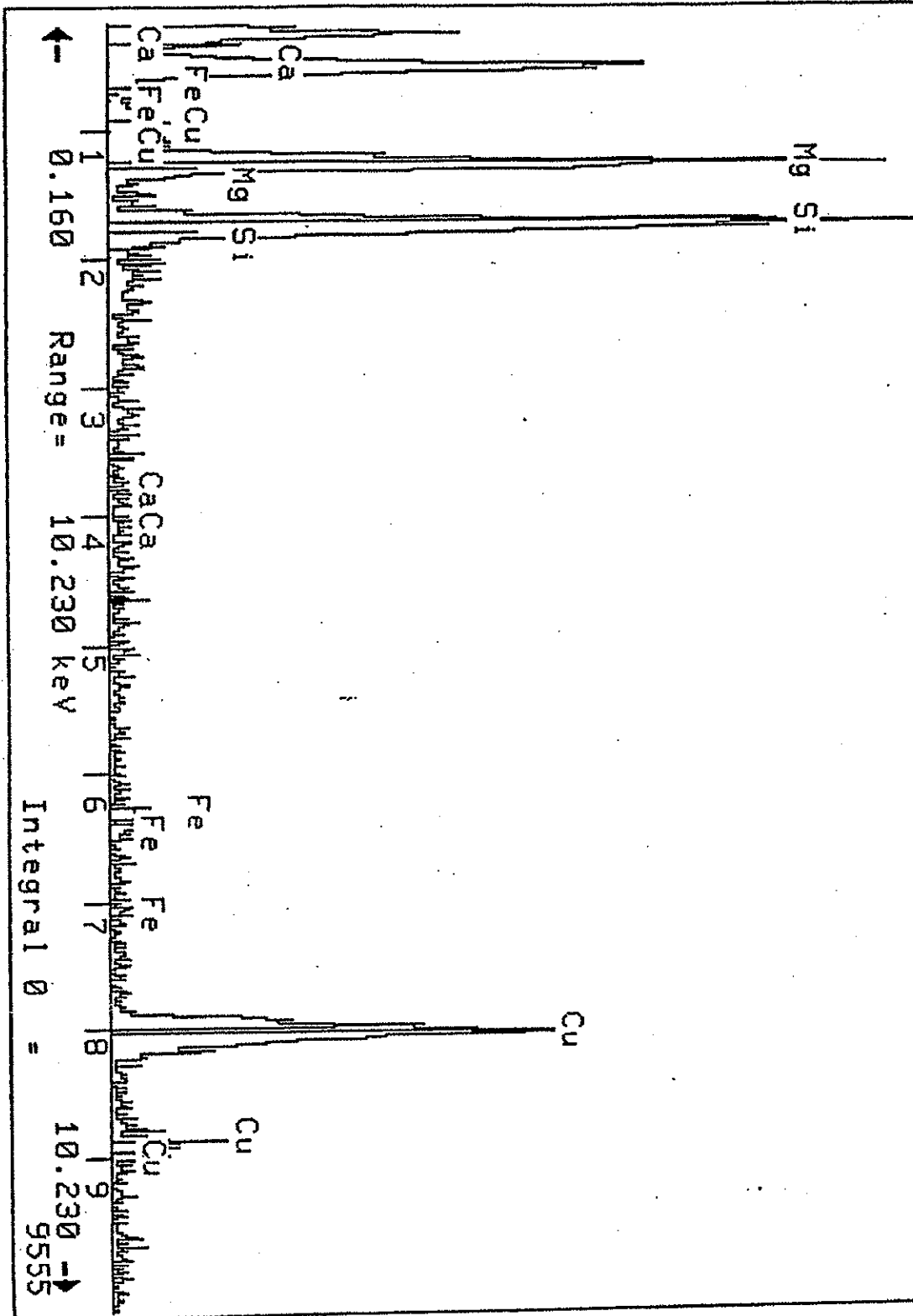
(F) 10STRUCTURES PER SQ. FT. FORMULA:

$$\frac{A}{B} \cdot \frac{C}{D} \cdot \frac{1}{E} \cdot F = (\text{asbestos structures per sq. ft.})$$

Calculations:

$$\frac{1339}{10 \cdot 0.008418} \cdot \frac{100}{2} \cdot \frac{1}{1} \cdot 10 = 7.954 \times 10^6$$

[illegible]



1 **PRUDENTIAL BUILDINGS: REPORT OF**

2 **WILLIAM M. EWING, CIH**

3
4 **I. INTRODUCTION AND BACKGROUND**

5 William M. Ewing, CIH of Compass Environmental Inc., 2231 Robinson Road, Suite B,
6 Marietta, Georgia 30068, was requested to evaluate selected buildings previously or
7 currently owned by Prudential. Mr. Ewing is an expert on asbestos in buildings issues.
8 Mr. Ewing is qualified as an expert in this area as a result of his education and experience
9 in the field of asbestos identification, evaluation and control.

10
11 Mr. Ewing received a Bachelor of Sciences in Biology from Washington and Lee
12 University. In 1978, Mr. Ewing worked at Clayton Environmental Consultants, Inc. as an
13 industrial hygienist. In 1981, he joined the Georgia Tech Research Institute and started
14 their industrial hygiene laboratory, instituted the hazardous waste program for small
15 business in Georgia, was director of the EPA-sponsored Asbestos Information Center, and
16 served as an industrial hygienist under the 7 (c) (1) program, sponsored by OSHA. In
17 1983, Mr. Ewing became board certified in the comprehensive practice of industrial
18 hygiene. He was re-certified in 1989 and 1995 in accordance with the American Board of
19 Industrial Hygiene requirements. In 1995 he was nominated by his peers and appeared as
20 an American Industrial Hygiene Association Fellow Member. In 1987, he left the Georgia
21 Tech Research Institute to take the position of Executive Vice President at The
22 Environmental Management Group, Inc. In 1990, Diagnostic Engineering, Inc. acquired

1 The Environmental Management Group, Inc. and employed Mr. Ewing as Regional
2 Technical Director until 1993 when he formed the consulting firm, Compass
3 Environmental, Inc., where he is currently the Technical Director.

4

5 During his career, Mr. Ewing has conducted numerous industrial hygiene, asbestos
6 management and environmental studies. He has authored several publications and served
7 on many committees, including governmental and industrial committees, to study the
8 following: identifying asbestos in buildings, disposal of asbestos-containing materials, and
9 removal of asbestos-containing materials in buildings. Mr. Ewing has provided asbestos-
10 related consulting services to property managers and building owners throughout the
11 United States and Canada. He has conducted over 1,000 asbestos surveys for asbestos-
12 containing material (ACM). He has developed asbestos management and control
13 programs in commercial and government facilities; including commercial office buildings,
14 schools, hospitals, ships, industrial plants and government buildings. In addition, Mr.
15 Ewing has frequently directed or lectured in training courses sponsored by universities,
16 government agencies and private interests on topics including industrial hygiene,
17 respiratory protection, and asbestos identification, evaluation, and control.

18

19 As a result of Mr. Ewing's work experience and asbestos training, he is qualified to offer
20 opinions related to asbestos in buildings including the following: the condition of the in-
21 place asbestos-containing materials; air, dust, and bulk sampling techniques; regulations
22 and guidance documents applicable to asbestos in buildings; the reasonableness of the

1 precautions taken by building owners and managers for maintaining in-place asbestos-
2 containing materials; the contamination in a building resulting from the in-place asbestos-
3 containing materials; options available to building owners and managers when dealing with
4 asbestos; the necessity to remove the in-place asbestos-containing materials during a
5 renovation; and the ultimate need to remove the asbestos-containing materials upon
6 demolition of the building. Mr. Ewing's expert qualifications and training are set forth
7 more fully in his Curriculum Vitae in Appendix A.

8
9 Mr. Ewing has testified as an expert on asbestos-in-building issues on several occasions in
10 both federal and state court. Included in Appendix B is a list of Mr. Ewing's asbestos
11 expert deposition and trial testimony over the last five years. Compass Environmental,
12 Inc. has and will be compensated for Mr. Ewing's time at a rate of \$145/hour.
13 Compensation for Mr. Dawson's time is at a rate of \$95/hour.

14
15 The purpose of the Prudential buildings evaluation was to review actions taken to date by
16 the building owner, conduct inspections of remaining fireproofing in the buildings,
17 determine the current condition of the remaining asbestos-containing fireproofing, conduct
18 sampling as appropriate, and opine on the reasonableness of the asbestos program
19 implemented by the building owner.

20
21 This report summarizes these findings and includes a description of methods employed, a
22 discussion of the findings, and conclusions drawn based on these findings. Included as

1 Appendices to this report are photographs and laboratory results of sampling conducted.
2 In addition to the references cited herein, Mr. Ewing may rely on the opinions, data and
3 publications contained in plaintiffs' other expert reports.
4

5 II. PROCEDURES AND METHODS

6 The buildings included for consideration are listed in Table 1. For all buildings,
7 documents related to asbestos-containing materials were reviewed. Site visits were made
8 to all buildings except the Short Hills Office Complex in Short Hills, New Jersey. The
9 Short Hills Office Complex in Short Hills was completely abated prior to demolition in
10 1984. ⁽¹⁻⁴⁾
11

12 **Table I. Selected Prudential Buildings**

<u>Building Name</u>	<u>Location</u>
Embarcadero I	San Francisco, CA
Embarcadero II	San Francisco, CA
Chatham Center/Hyatt	Pittsburgh, PA
130 John Street	New York, NY
Hunt Valley Marriott	Hunt Valley, MD
5 Penn Center	Philadelphia, PA
Prudential Plaza	Newark, NJ
Brookhollow I	Houston, TX

Short Hills Office Complex	Short Hills, NJ
Renaissance Tower	Dallas, TX
Northland Towers	Southfield, MI
First Florida Tower	Tampa, FL
Northwest Financial Center	Bloomington, MN
1100 Milam	Houston, TX
Prudential Plaza	Denver, CO
Southdale Office Complex	Edina, MN
Century Center I & IV	Atlanta, GA
Twin Towers	Atlanta, GA

1

2 For each building various asbestos-related documents were reviewed, often including the
3 asbestos survey, operations and maintenance program and floor plans. These documents
4 were reviewed to gain an understanding of the building lay-out, use, occupancy, and the
5 types of asbestos-containing materials known to be present, and their locations.
6 Arrangements for the building visits were made with each building representative. This
7 was often the building manager or building maintenance director. Assistance was usually
8 provided by building maintenance staff, local asbestos consultants, and/or local asbestos
9 abatement contractors, as necessary.

10

11 The results of asbestos surface dust sampling for each building visited were reviewed.

12 These samples were collected by Law Associates, Inc. and analyzed by Materials

1 Analytical Services, Inc. (MAS). All of these samples were collected in 1988 - 1995. The
2 results of bulk sample analyses were also reviewed with William E. Longo, Ph.D. of MAS.
3 For these buildings the focus was the spray-applied asbestos-containing fireproofing.

4
5 At each building a visual inspection of the remaining fireproofing was conducted to
6 determine its current condition and accessibility. The assessment techniques employed
7 were as described in the Asbestos Hazard Emergency Response Act (AHERA) regulations
8 promulgated by the US Environmental Protection Agency (EPA).⁽⁵⁻⁷⁾ The Asbestos
9 School Hazard Abatement Reauthorization Act (ASHARA) extended certain provisions of
10 the AHERA regulation to public and commercial buildings.⁽⁸⁾ One significant provision
11 was the requirement that only accredited inspectors perform building inspections.⁽⁹⁾ The
12 assessment procedures used by accredited inspectors is that prescribed by AHERA.

13
14 The AHERA assessment procedures place each friable asbestos-containing material into
15 an assessment category based on its degree of damage. For a surfacing material such as
16 friable fireproofing the available categories include:

- 17
18 1. Significantly damaged friable surfacing ACBM (asbestos-containing building
19 material) - a material exhibiting greater than 10% damage evenly distributed or
20 25% damage in a localized area.

1 2. Damaged friable surfacing ACBM - a material exhibiting greater than 1 - 2%
2 damage and less than 10% damage evenly distributed or 1 - 2% damage and
3 less than 25% damage in a localized area.

4
5 3. Friable surfacing ACBM with a potential for significant damage - a material
6 that is not damaged or significantly damaged but has the potential for damage
7 that would be both extensive and severe.

8
9 4. Friable surfacing ACBM with a potential for damage - a material that is not
10 damaged or significantly damaged but has the potential for damage to occur.

11
12 5. Other friable ACBM - a surfacing material that does not fall into one of the
13 four previous categories.

14
15 Damage of a surfacing material is evidenced by the presence of physical damage such as
16 gouges, blistering, and vandalism; water damage indicated by stains, flaking, or
17 delamination; and damage due to deterioration or vibration. Damage due to deterioration
18 or vibration is visually assessed by the presence of ACBM debris (having the same color
19 and texture) on surfaces beneath the ACBM.

20
21 In addition to the visual assessment, surface dust sampling was also conducted in six
22 buildings. Small particles, generally less than 1 millimeter (mm) in diameter, cannot

1 usually be identified as ACBM based on color and texture. Dust sampling with analysis by
2 transmission electron microscopy (TEM) allows for a quantitative estimate of asbestos
3 structures on surfaces. Since dust sampling had been conducted previously in most of
4 these buildings, the primary purpose was to augment the previous sampling and conduct
5 side-by-side measurements to compare results using the 1988 methodology with the 1995
6 ASTM method D 5755-95.

7

8 In each of five Prudential buildings, three locations were randomly selected. Each location
9 was a horizontal non-porous surface beneath asbestos-containing fireproofing. All
10 locations had a visually discernible layer of dust. No particles greater than 1 mm in
11 diameter were on the surfaces sampled. At each location, two samples were collected
12 side-by-side. One of these samples was collected using the 1988 methodology and one
13 collected as described in the current ASTM method.

14

15 The sampling conducted in 1988 - 1989 by Law Associates used a 37 mm diameter
16 cassette attached to a pump calibrated at 2 liters per minute (l/min). These samples were
17 collected from a measured surface area, usually one square foot. The 1988 - 1989
18 sampling used a 0.8 μ m pore size mixed cellulose ester (MCE) filter and collected the
19 sample open face.

20

21 The ASTM standard method in 1995 allows for a 25 mm cassette, any pore size equal to
22 or less than 0.8 μ m, an MCE filter, and a standard collection area of 100 cm² (although

1 smaller or larger areas are allowed). The significant difference is the addition of a sample
2 collection nozzle providing a standard flowrate at the surface of approximately 100
3 centimeters per second (cm/sec). This value is considerably higher than the 6.4 cm/sec
4 velocity when an open face 37 mm cassette is used (33 mm effective area). A copy of the
5 ASTM method is included at Appendix C.

6
7 All dust samples were submitted to MAS for analyses. It was requested the laboratory
8 follow the same procedures followed in 1988 for the 37 mm cassettes and the ASTM
9 standard method for the 25 mm cassettes. Eight field blank (control) samples were also
10 submitted as a check for systematic contamination in the field or laboratory. Results were
11 reported as asbestos structures per square centimeter (s/cm^2) and asbestos structures per
12 square foot (s/ft^2).

13
14 Following the building visits, additional documents related to the asbestos in the
15 Prudential buildings were reviewed. These consisted of additional building surveys,
16 asbestos management procedures, abatement records, air monitoring reports, laboratory
17 reports, and other miscellaneous records. In addition, documents and deposition
18 transcripts of defendants' representatives were reviewed. Principal documents relied upon
19 appear in the reference list at the conclusion of this report.

20
21 **III. PRESENTATION AND DISCUSSION OF FINDINGS**

- 1 Findings are discussed below by building followed by a general discussion of topics that
- 2 apply to multiple buildings.

1 N. CENTURY CENTER I & IV, ATLANTA, GA

2

3 The Century Center complex is located in northeast Atlanta and includes two office
4 buildings with asbestos-containing fireproofing originally installed. One of these buildings
5 is an 12-story structure located at 2200 Century Parkway. The other is a five-story
6 building located at 2600 Century Parkway.

7

8 A 1986 survey of the 2200 and 2600 buildings indicated both buildings had asbestos-
9 containing fireproofing applied to all floors.⁽⁵⁴⁾ Subsequent constituent analysis
10 determined the fireproofing was a product known as Monokote MK-III.⁽³⁸⁾

11

12 In 1986, BCM Converse (consultant) collected five surface samples from the 4th floor of
13 the 2200 building. Three were wipe samples reported as "too dirty to read." Two were
14 vacuum samples reported as "significant quantity of fibers resembling the configuration of
15 asbestos fibers."⁽⁵⁴⁾ These results are considered inconclusive.

16

17 In 1988, Law Engineering collected 18 surface dust samples from locations throughout
18 the 2200 and 2600 buildings.⁽⁵⁵⁾ These results demonstrated a high level of asbestos
19 contamination on building surfaces below the asbestos-containing fireproofing. These
20 results are summarized in Appendix D.

21

1 The 1986 BCM Converse survey determined the fireproofing was friable. This consultant
2 recommended these friable asbestos-containing materials be managed through an
3 operations and maintenance program until redevelopment or remodeling occurs. It was
4 recommended all friable materials be removed at that time. The operations and
5 maintenance program was issued on July 18, 1986 and revised in January 1988.^(56, 57) All
6 the fireproofing was removed (except at the perimeter beams which was not accessible)
7 during 1988 - 1992 in conjunction with renovation of the buildings.⁽⁵⁸⁾

8
9 William M. Ewing, CIH and Tod A. Dawson of Compass inspected the two buildings on
10 April 30, 1996. The inspection confirmed the buildings are multi-tenant office buildings.

11 The fireproofing was located in a return air plenum which also houses utilities such as
12 electrical conduit, communication cables, ventilation equipment, and plumbing. The
13 sprinkler system was installed during the renovation to comply with the Atlanta building
14 code.⁽⁵⁸⁾

15
16 Building records related to asbestos were reviewed. Only two personal air samples were
17 located measuring exposure during maintenance or renovation activities. These results
18 were less than 0.05 f/cc and 0.345 f/cc for two workers removing ceiling tile and using a
19 HEPA vacuum.⁽⁵⁹⁾ These results are summarized in Table 7 of Appendix F.

1 **S. ROUTES OF ASBESTOS EXPOSURE IN BUILDINGS**

2
3 Asbestos exposure from friable in-place materials occurs in several ways. First, asbestos
4 fibers are slowly released through deterioration over time. In the EPA guidance
5 document, Controlling Asbestos-Containing Materials in Buildings, they stated, "Areas
6 covered by ACM tend to be large. If the material is friable, fibers are slowly released as
7 the material ages."⁽⁸³⁾ This concept was also recognized in the guidance document issued
8 by the British Department of the Environment which stated, "As it ages, sprayed asbestos
9 may release more fibers and asbestos dust may accumulate in adjacent areas."⁽⁸⁴⁾

10
11 The second common method of fiber release from in-place friable ACM is through impact
12 or direct contact. This form of release occurs when the material is struck, scraped or
13 brushed such as during maintenance or renovation activities. The magnitude of the release
14 is proportional to the intensity of the activity causing the disturbance.

15
16 Once asbestos fibers are liberated from a material such as fireproofing, the fibers will
17 slowly settle onto surfaces. If not removed, the surfaces will accumulate increasing
18 concentrations of asbestos dust. This dust may then become resuspended into the air.
19 Custodial and maintenance procedures such as sweeping floors with asbestos dust or
20 changing ceiling tiles with settled dust are examples of activities which re-suspend dust
21 into the air.

1 These concepts of fiber release and re-suspension are widely recognized and have been
2 demonstrated repeatedly in observational and experimental studies.⁽⁸⁵⁻⁹⁰⁾

3
4 **T. EPISODIC EXPOSURE STUDIES**

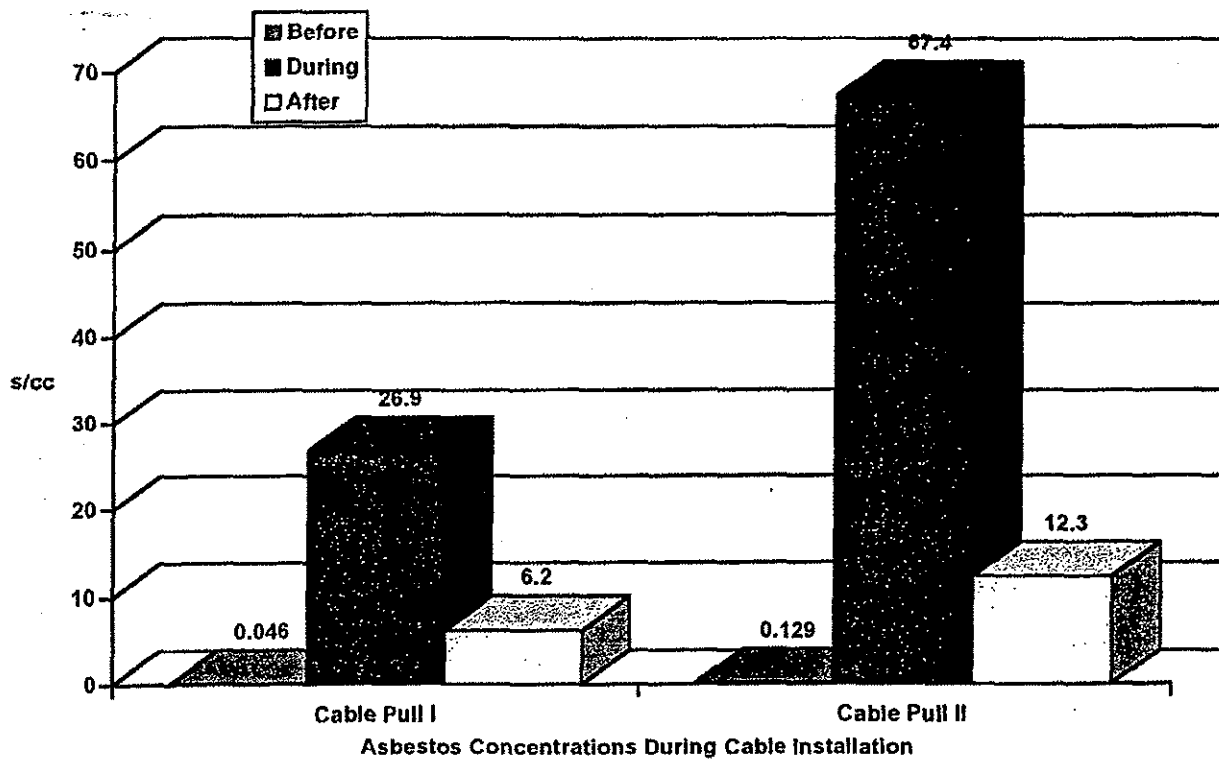
5
6 Industrial hygienists often refer to asbestos exposures in buildings as being either prevalent
7 level or episodic. Prevalent level exposure refers to the continuous concentration of
8 asbestos in the air. Prevalent level exposures are usually low in buildings with spray-
9 applied fireproofing.⁽⁹¹⁻⁹²⁾ Area air sampling has traditionally been used to measure the
10 prevalent level.

11
12 Episodic exposures are often associated with a specific activity which disturbs the in-place
13 fireproofing or settled dust containing asbestos. Such exposures represent a rapid rise in
14 the airborne asbestos concentration followed by a gradual decline.⁽⁹¹⁾ Episodic exposures
15 generally are limited to portions of the building where the activity occurs. However,
16 ventilation patterns may distribute airborne asbestos to adjoining areas or even remote
17 locations. Periodic air sampling in a building, such as once a year or every 6 months is
18 unlikely to detect episodic exposures. For this reason the EPA recommends against air
19 sampling alone for assessing the condition of asbestos-containing materials.^(83,93)

20
21 In a series of studies, episodic exposures were evaluated during routine maintenance and
22 custodial activities in buildings with surfacing ACM. Five of these studies were conducted

1 in buildings with spray-applied fireproofing which was the same or substantially similar to
2 the fireproofing in the Prudential Buildings. The results of these studies have been
3 published in peer-reviewed journals and are summarized in Figures 1 - 5.^(87, 89, 90)

4
5 In each of the five studies a particular maintenance, renovation or custodial activity was
6 chosen. Area air sampling was conducted before, during, and after each activity. Personal
7 air samples were also collected on the individuals performing the activities. All samples
8 were analyzed by transmission electron microscopy (TEM) and the personal samples were
9 analyzed by TEM and phase-contrast microscopy (PCM). In each study it was found that
10 the asbestos exposures during the activity increased significantly when compared to
11 concentrations in the air before the activities began. In each instance, the source of the
12 asbestos exposure was the fireproofing, or the dust and debris from the fireproofing.

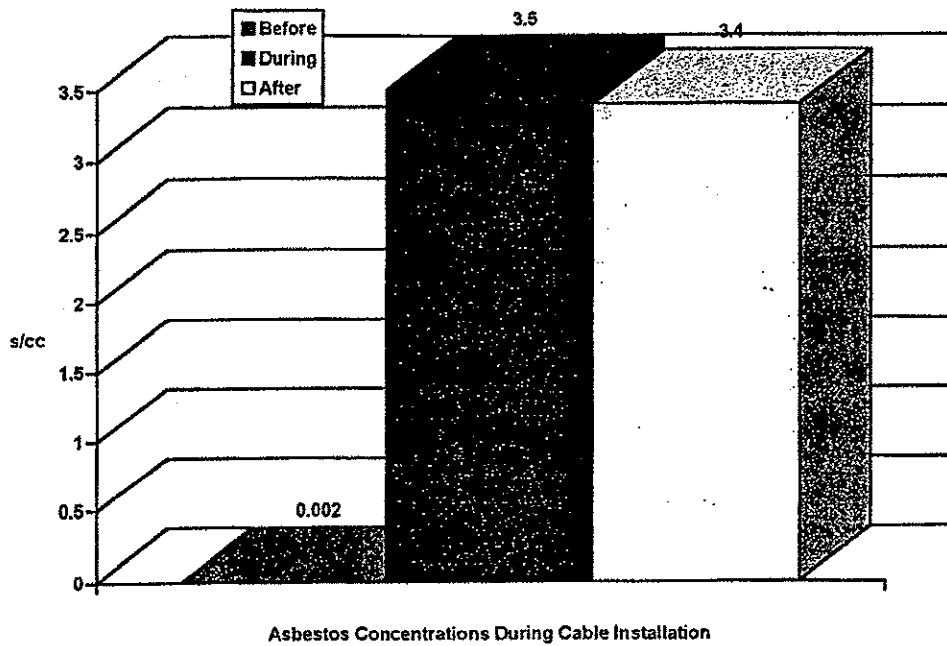


DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Cable Pull I				
Phase	Arithmetic Mean (s/cm ³)	Arithmetic		Number of Observations
		Std. Dev. (s/cm ³)	Geometric Mean	
Before Inst.	0.052	0.030	0.046	5
During Inst.	28.9	12.6	26.9	5
During (Pers.)	10.5	11.6	7.1	3
After Inst.	8.4	7.0	6.2	6

Cable Pull II				
Phase	Arithmetic Mean (s/cm ³)	Arithmetic		Number of Observations
		Std. Dev. (s/cm ³)	Geometric Mean	
Before Inst.	0.158	0.094	0.129	5
During Inst.	100.2	91.9	67.4	4
During (Pers.)	124.8	85.6	102.7	3
After Inst.	17.0	13.5	12.3	4

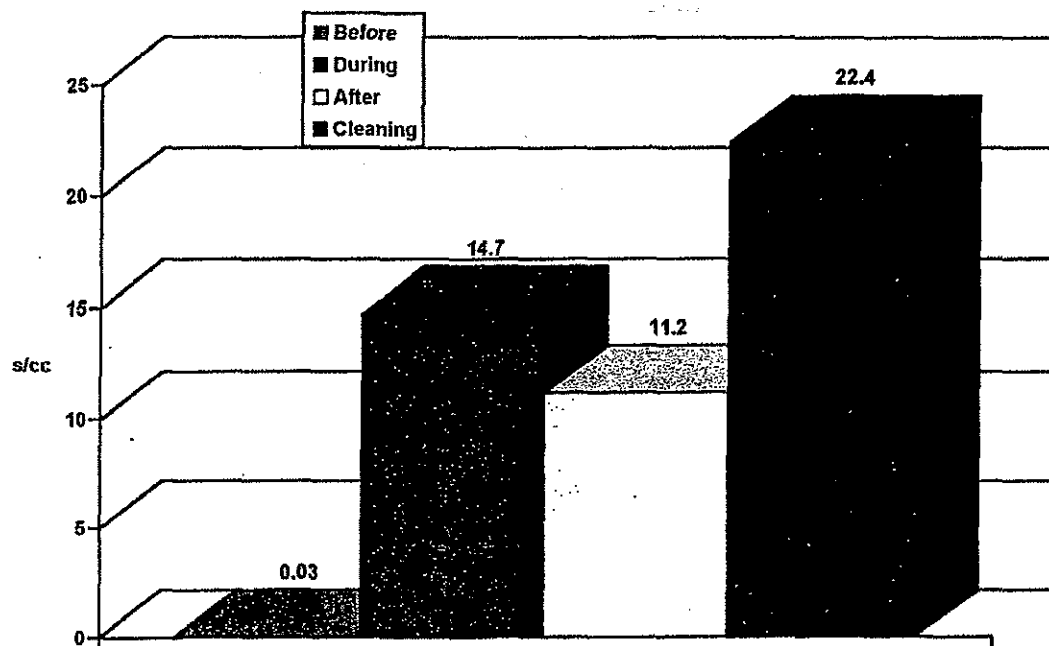
Figure 1. Episodic Exposure Results Before, During and After Installation of Cables in the Vicinity of High Density Fireproofing



DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Phase	Arithmetic Mean (s/cm ³)	Arithmetic Std. Dev. (s/cm ³)	Geometric Mean	Number of Observations
Before	0.006	0.014	0.002	5
During (Area)	3.6	0.84	3.5	5
During (Pers.)	26	7.5	26	2
After	3.8	1.9	3.4	5

Figure 2. Episodic Exposure Results Before, During and After Installation of Cables in the Vicinity of Low Density Fireproofing



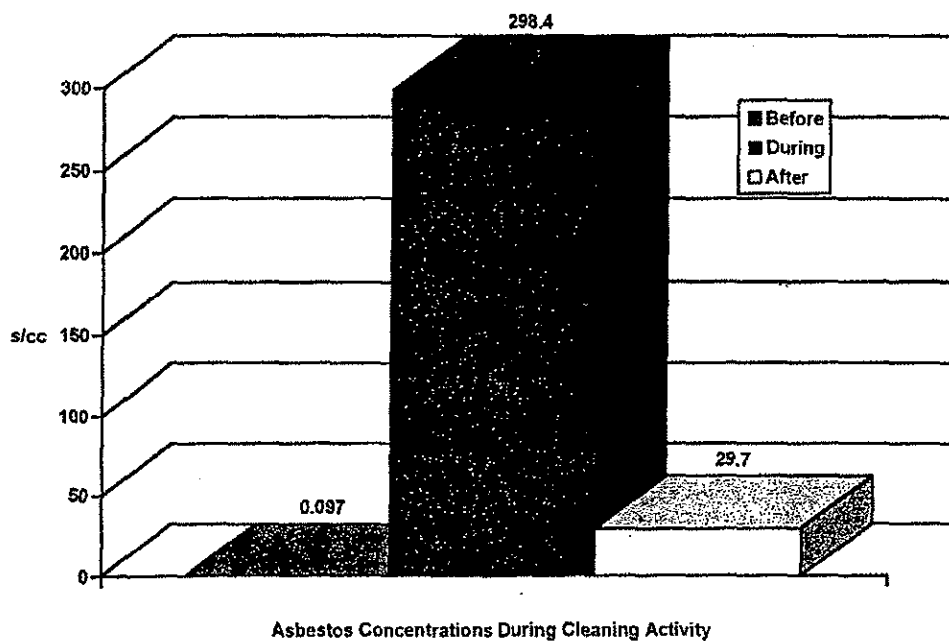
Asbestos Concentrations During Ceiling Tile Replacement

DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Phase	Arithmetic Mean (s/cm ³)	Range (s/cm ³)	Geometric Mean (s/cm ³)	Number of Observations
Before	0.05	ND - 0.08	0.03	5
During	15.3	10 - 20	14.7	5
During (Pers.)	23.0	22 - 24	23.0	2
After	11.4	9 - 14	11.2	5
Cleaning	22.4	20 - 24	22.4	5

ND = No Asbestos Structures Detected

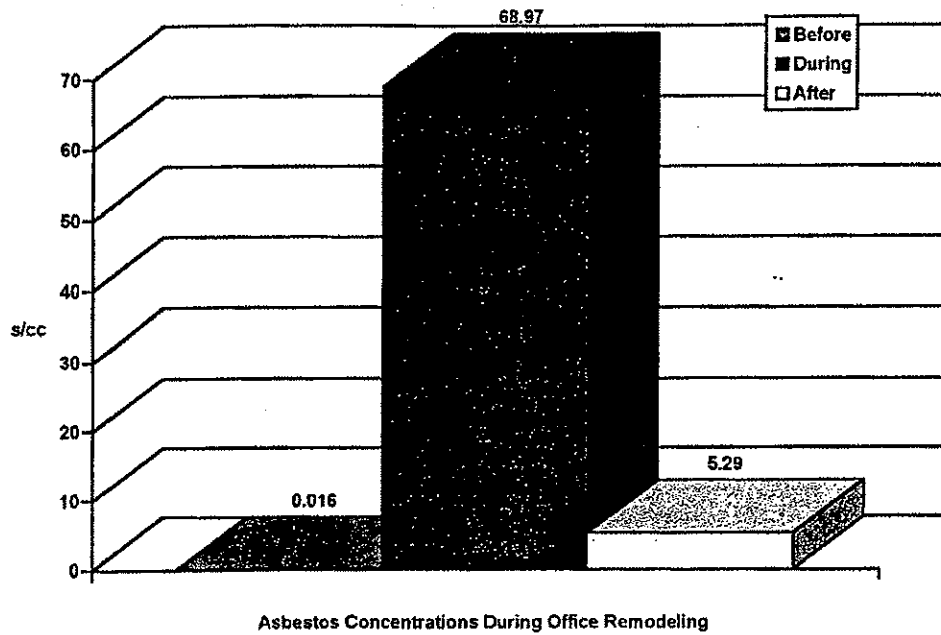
Figure 3. Episodic Exposure Results Before, During, and After Replacement of Ceiling Tiles Below Fireproofing



DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Phase	Arithmetic Mean (s/cm ³)	Arithmetic Std. Dev. (s/cm ³)	Geometric Mean	Number of Observations
Before - Inside	0.264	0.221	0.097	5
During - Inside	329.9	173.0	298.4	5
During - Inside (Personal)	343.8	360.6	237.1	3
After - Inside	31.8	12.3	29.7	5

Figure 4. Episodic Exposure Results Before, During and After Cleaning a Storage Room in a Building with Fireproofing



DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Phase	Arithmetic Mean (s/cm ³)	Arithmetic Std. Dev. (s/cm ³)	Geometric Mean	Number of Observations
Before	0.045	0.048	0.016	5
During (Area)	73.32	27.08	68.97	6
During (Pers.)	150.79	164.68	71.60	4
After	5.81	2.39	5.29	4

Figure 5. Episodic Exposure Results Before, During and After Remodeling One Office in a Building with Fireproofing

1 U. MAINTENANCE AND RENOVATION EXPOSURE DATA

2
3 A review was conducted of the asbestos-related files stored at the offices of Riker,
4 Danzig, Scherer, Hyland & Perretti in Morristown, NJ. The purpose of the review was to
5 extract air sampling data collected during maintenance, custodial, and renovation activities
6 in the Prudential buildings discussed in this report. No effort was made to locate data for
7 other Prudential buildings. In excess of 375 file boxes were reviewed by William M.
8 Ewing, CIH and Tod A. Dawson.

9
10 No custodial worker's exposure data was located for these buildings. This is not unusual
11 since custodians have only rarely been monitored for asbestos exposure.⁽⁹¹⁾ Maintenance
12 and renovation activity exposure sampling was located for eleven buildings. These
13 included Embarcadero Center I, Embarcadero Center II, One Chatham Center, 5 Penn
14 Center, Renaissance Center, Prudential Plaza - Denver, Southdale Office Complex, Twin
15 Towers, Century Center, First Florida Tower, and the 1100 Milam Building. Only the
16 personal samples were selected from the data available for ten of these buildings. Since
17 the data available from the Chatham Center included only two personal samples which
18 were too heavily loaded to analyze, the area samples from this building were included. All
19 samples included have been summarized in Tables 1 - 11 of Appendix F.

20
21 All the samples included were stated to be collected and analyzed by either National
22 Institute for Safety and Health (NIOSH) method 7400, or its predecessor NIOSH method

1 P&CAM 239.^(94, 95) Both methods collect airborne particles by passing air through a filter.
2 The filter is then analyzed by phase contrast optical microscopy for fibers. Any fibers
3 greater than 5 micrometers long, approximately 0.25 micrometers wide, and having an
4 aspect ratio of 3:1 are included in the count. Limitations of the method include the
5 inability to identify asbestos fibers or "see" (resolve) thin fibers/bundles of asbestos. It
6 was and continues to be widely used since it is the "OSHA method," is inexpensive,
7 provides quick results, and is widely available.

8
9 The work activities monitored and summarized in Appendix F include maintenance and
10 renovation activities performed in the vicinity of asbestos-containing fireproofing. Such
11 activities include replacing ceiling tiles, installing cables, electrical conduit and copper
12 pipe, removing light fixtures, shooting pipe hangers, installing ceiling tile grid, removing
13 duct work, removing walls, and clean-up activities. Efforts were made during the
14 selection of samples for inclusion not to include samples where removal of fireproofing
15 was occurring. The sources for the data included are listed at the end of each table and
16 given in the Reference section of this report.^(41, 42, 43, 52, 53, 59, 64, 65, 72, 73, 79, 82, 96-105)

17
18 A total of 1097 samples (1066 personal samples, 31 area samples) are included in the data
19 set. Of these, 22 samples are reported as overloaded and 3 samples were reported voided.

20
21 Of the 1066 personal samples, 505 (47%) were greater than or equal to 0.1 f/cc and 82
22 (8%) were greater than 1 f/cc. These results are depicted in Figure 6. These results are

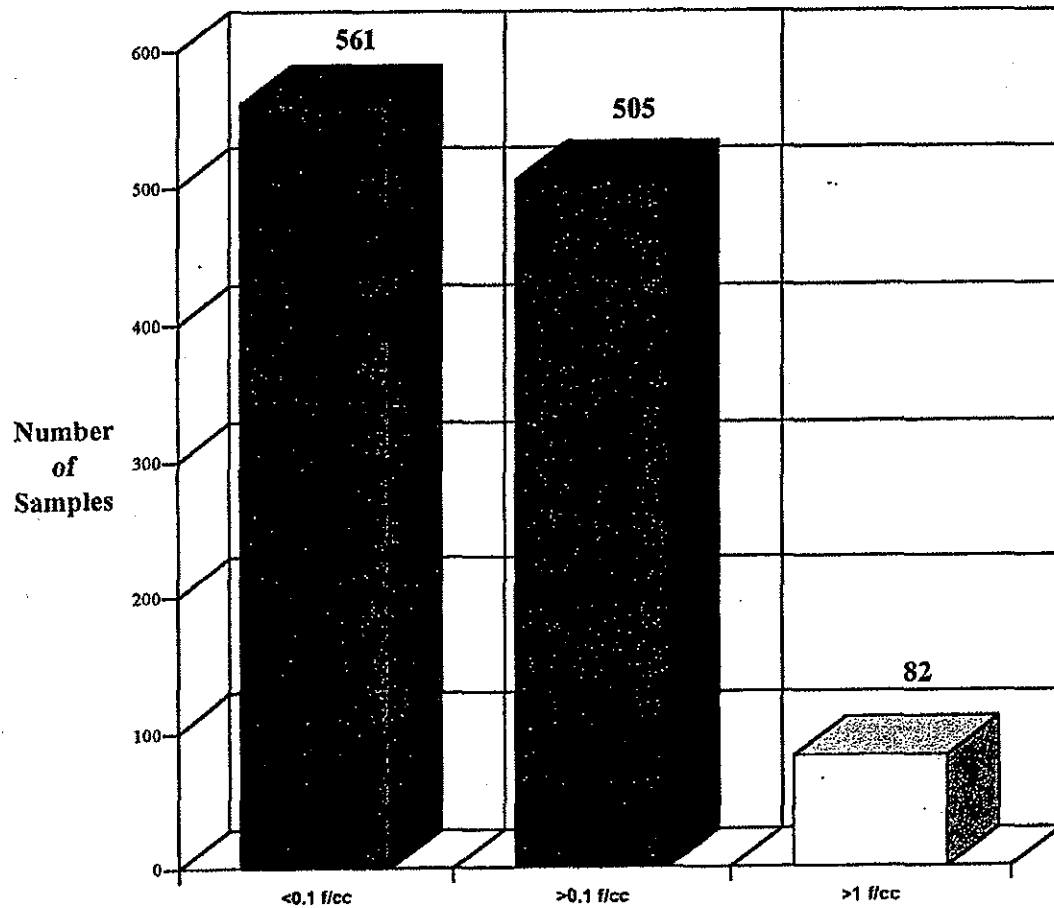


Figure 6. Distribution of Fiber Concentrations Measured on Persons Performing Maintenance and Renovation Activities in Prudential Buildings (1066 samples)

1 consistent with results reported in the published literature and further demonstrate that
2 maintenance and renovation activities in buildings with spray-applied friable fireproofing
3 routinely cause elevated airborne exposures.

5 V. SURFACE DUST EVALUATION

6
7 The results of surface dust samples collected and analyzed by ASTM method D 5755-95
8 for Embarcadero Center I, II, 5 Penn Center, Renaissance Tower, Northland Towers, and
9 Prudential Plaza (Newark) were discussed in conjunction with the individual building site
10 visits in this report. At 15 dust sampling locations a second sample was also collected
11 using the method previously employed by Law Engineering, Inc. in these buildings. The
12 sampling and analytical techniques are described in the Procedures and Methods section of
13 this report. All results are tabulated in Appendix D and the laboratory reports included as
14 Appendix E.

15
16 The results were evaluated and a correlation performed on the 15 pairs of sample results.
17 For all 15 pairs a positive correlation coefficient of 0.62 was obtained with a slope of
18 5.165 and an intercept of 2.73×10^6 . Further analysis found the correlation coefficient for
19 three buildings (EC I, EC II, and Renaissance) to be 0.80 with a slope of 4.875 and an
20 intercept of 3.7×10^5 . When the correlation coefficient is calculated for the sample pairs
21 collected in the remaining two buildings (5 Penn Center and Prudential Plaza - Newark)
22 the results is 0.98 with a slope of 18.27 and an intercept of -1.16×10^5 . The reason for

1 the correlation of the subsets to be better than the correlation of the entire set is the
2 different slopes of the regression lines.

3

4 Basically, it was determined that the ASTM method D 5755-95 provides results 17 and 22
5 times greater than the earlier Law Engineering method in the 5 Penn Center and Prudential
6 Newark buildings, respectively. In the Embarcadero Center Buildings (2) and the
7 Renaissance Tower the increase using the ASTM method D 5755-95 was, on average, 4 -
8 7.3 times the Law Engineering method. In no sample was the ASTM method result lower
9 than the corresponding side-by-side sample collected according to the Law Engineering
10 procedure.

11

12 The one significant difference between the two methods is the sample collection. The
13 ASTM method employs a sample nozzle with a known diameter of 0.63 cm and a flowrate
14 of 2.0 l/min. This provides a face velocity at the point of dust collection of 106 cm/sec.
15 The Law Engineering method used an open face 37 mm cassette with an effective
16 collection area (diameter) of 33 mm. Also operating at 2.0 l/min, this provides a face
17 velocity at the point of dust collection of 6.4 cm/sec. Accordingly, the ASTM method
18 provides a face velocity over 16 times the face velocity of the Law Engineering method.

19

20 A total of 1053 asbestos structures were identified, characterized and sized in the 30
21 samples. No asbestos structures were detected in the 8 blank (control) samples. Each
22 asbestos structure was characterized as either a bundle, matrix, cluster, or fiber. Table 2.